McVITIE & PRICE'S OATCAKES.

THE PRACTICAL TEACHER

DR. T. J. MACNAMARA, M.P.

ERNEST GRAY, M.A., M.P.

J. H. YOXALL, M.A., M.P.

THE PRACTICAL TEACHER AS M.P.

EMPIRE SUPPLEMENT II. PRESENTED WITH THIS NUMBER.

CONTENTS

OF THE

NOVEMBER NUMBER.

THE PRACTICAL TEACHER AS M.P. 221
GEOGRAPHY IN ELEMENTARY SCHOOLS. By T. G. Rooper, H.M.I. 222
THE PRACTICAL TEACHER AT PARIS 226
GOOD NEWS FOR STUDENTS OF FRENCH 227
A PRACTICAL TEACHER OF INDUSTRIAL ART 230
OUR PHOTOGRAPHIC COMPETITION 232
EDUCATION IN ENGLAND. N.U.T. Notes, etc. By T. B. Ellery, F.R.G.S. 233
EDUCATION IN SCOTLAND. E.I.S. Notes, etc. By James Paterson 234
NOTES FROM THE NORTH 235
FOREIGN NOTES 237
OUR EMPIRE SUPPLEMENTS—
2. BRITISH IMPORTS AND EXPORTS 238
BLACKBOARD DRAWING 239
PRACTICAL ELEMENTARY SCIENCE 241
ELEMENTARY LESSONS IN THE PRINCIPLES OF GRAMMAR 243
A SPECIMEN SCHEME OF OBJECT LESSONS 244
OUR ILLUSTRATED GEOGRAPHICAL NOTEBOOK 245
THE INSPECTOR'S NOTEBOOK 246
NATURE LESSONS FOR INFANTS 247
KINDERGARTEN. By Mrs. R. A. Cashmore, Goodrich Road Board School, London 248
OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE. By A. T. Flux 251
OUR CERTIFICATE COURSE FOR 1901. By G. Collar, B.Sc. 256
LONDON MATRICULATION. By R. C. B. Kerin, B.A. 259
QUERY COLUMN 261
STAR STUDY FOR SCHOLARSHIP STUDENTS 265
CHEMISTRY NOTES 266
NOTES ON ADVANCED AND HONOURS PHYSIOGRAPHY .. 267
MATHEMATICS 267
NOTES ON THEORETICAL MECHANICS 269
ELECTRICITY AND MAGNETISM 270
OUR FRENCH PRIZE COMPETITION 271
THE EDITOR'S TABLE 272

·VOL· XXI No. 5

EDITORIAL, PUBLISHING AND ADVERTISING OFFICES OF "THE PRACTICAL TEACHER" 35 & 36 PATERNOSTER ROW, LONDON, E.C. NEW YORK OFFICE, 37 EAST EIGHTEENTH STREET.

PRICE 6D.

FRY'S PURE CONCENTRATED COCOA.

DIPLOMA . .

CORRESPONDENCE

. . COLLEGE.

PRINCIPAL.

J. W. KNIPE, Ph.D., L.C.P., F.R.S.L.,

Member of Council of the Royal Society of Literature.

TUTORS

On the Regular Staff.

T. CARTWRIGHT, B.A., B.Sc. Lond.
C. V. COATES, M.A. Camb. and R.U.I., Gold Medallist.
C. E. CULLIS, M.A. Camb., Ph.D. Jena, Fellow of Gonville and Caius.
W. J. ADDIS, B.A. Lond., Triple Honours.
HENRI BLOUET, B.A.
E. B. LE FRANÇOIS.
W. HALLIWELL, B.Sc. Lond.
W. HARRISON, M.A. Camb., Mus. Bac. Oxon.
T. HAY, M.A. Camb., B.Sc. Lond., A.C.P.
T. S. HEPPENSTALL, 1st Class Honoursman.
C. HEPPLE, B.Sc. Durham.
J. LOCKEY, M.A. Lond., F.C.P., Doreck Scholar.
H. T. MARK, B.A. Lond., B.Sc. Vict.
J. C. NESFIELD, M.A. Oxon.
A. SMITH, B.Sc. Lond., L.C.P., Triple Honoursman.
W. W. WHISTLER, B.A., B.Sc. Lond.
T. W. WORMELL, B.Sc. Lond., F.C.S.
H. F. WRIGHT, M.A., LL.D. Cam., 1st Class Honoursman.

AND

Thirteen Trained Certificated Masters.

Principal's Assistant.

J. H. THEAKSTONE, A.C.P. London University, Hons. Science (S. Kens.), formerly Principal of the Higher-Grade School, Worthing.

Courses for

PUPIL TEACHERS.

April and October 1901.

SCHOLARSHIP.

December 1901.

CERTIFICATE.

July 1901.

A. C. P. DIPLOMA.

July 1901.

Separate Prospectus for either Examination (post free) on application to the Secretary,

DIP. CORR. COLL.,

Fishponds, Bristol.

AYRES'

CERTIFICATE

AND

SCHOLARSHIP

CLASSES.

ORAL CLASSES

MEET AT THE

Ward Schools, 181 Aldersgate Street and 16 Bridgwater Square, E.C.

SCHOLARSHIP CLASS, 1901.

Class Commences Sept. 29.

BEST OBTAINABLE PREPARATION GUARANTEED.

CORRESPONDENCE CLASSES.

Special Points in connection with the Class:—

1. Work is regularly sent and promptly returned.
2. Solutions are given to all Arithmetic, Algebra, Parsing, and Analysis, with full Explanatory Notes.
3. Model Answers are sent weekly to all typical Questions, Essays, etc.
4. Special Courses of Papers in all subjects are given.
5. The Course of Papers includes all the most recent Questions.
6. The Fee is strictly inclusive.

Intending Students should join as soon as possible.

KINDERGARTEN CORRESPONDENCE CLASS.

For Prospectus, References, Testimonials, etc., apply to

Mr. H. B. AYRES,

4 ARUNDEL SQUARE, BARNSBURY, LONDON, N.

BRITISH MUSEUM

THE PRACTICAL TEACHER

A MONTHLY MAGAZINE AND REVIEW FOR THE SCHOOL-ROOM AND THE STUDY

Vol. XXI. No. 5. NOVEMBER, 1900. Price 6d.

NOTICES TO CORRESPONDENTS AND SUBSCRIBERS.

☞ ***Subscribers who do not receive the SUPPLEMENT presented with this Number are asked to promptly communicate with us, and to send at the same time name and address of Bookseller or Newsagent through whom the Magazine is obtained.***

All literary communications should be addressed :—
Office of "THE PRACTICAL TEACHER,"
35 and 36 Paternoster Row, LONDON, E.C.

"The Practical Teacher" may be ordered of any Newsagent, Bookseller, or at any Bookstall in the United Kingdom.

Subscribers wishing to have the Journal posted regularly to them from this Office can subscribe upon the following terms :—

	One Year.	Half Year.
United Kingdom, Continent, Colonies, and United States	7/-	4/-

Remittances, Post-Office Orders, Cheques, etc., should be made payable to Henry Schuermier.

Rates for Advertisements upon application.

"THE PRACTICAL TEACHER" may be ordered through all Colonial Booksellers and Newsagents. Monthly supplies are regularly sent to the chief towns in Australasia, South Africa, and India. Copies can also be obtained at our

NEW YORK OFFICE: 37 East 18th Street;

AND AT

PARIS: Neal's Library, 248 Rue de Rivoli;

BERLIN: Gsellius'sche Buchhandlung, Mohren Strasse.

THE PRACTICAL TEACHER AS M.P.

"Three merry men, and three merry men,
Three merry men be we."—*Old Song.*

IF the National Union of Teachers publishes a work on the Gentle Art of Successful Electioneering, the book may hope for a good sale, for it is acknowledged on all sides that the N.U.T. knows how to win, and that, too, handsomely. To bring Mr. Gray back from a "pendulum" constituency with a majority increased from 704 to 2,480 was no mean accomplishment. To bring Mr. Yoxall back at all, despite the flowing tide, was equally creditable. But for magnetic Macnamara to win a seat, and to defeat obscurantist Diggle by the handsome majority of 1,335, was simply magnificent. Certainly the teacher trio have a right to be merry men, and so have the sixty thousand teachers behind them; and we commend the old song to Dr. Macnamara, when he is called upon to sing at the Yarmouth Conference concert, as strictly appropriate to the occasion. And if the teaching profession is to be congratulated upon the success of the trio, we may say without the least exaggeration that West Ham, Nottingham, and Camberwell are to be felicitated upon the sound sense they have shown in sending three such men as the teacher members to St. Stephen's; for it may be said with legitimate pride that Messrs. Gray and Yoxall bore themselves right yeomanly in the Parliament just deceased, and we have no fear as to the part that will be played by Dr. Macnamara in the Parliament that is coming into existence. Not only will education benefit by the addition of his name to the roll of members, but we are assured that, so far as lies in his power, the people at large will have their condition bettered.

The question now is, which of the three will win in the race for the Ministry of Education; for surely the day will come when the man who knows will be put in the place where his knowledge may be of most use to the nation at large. We have seen, in respect to the War Office, how the man who does not know may occasion disaster; and it will in course of time be brought home to men's minds that the wisest and the safest plan, if disaster in the schools is to be averted, will be to put a practical teacher at the head of the Board of Education. Pleasant visions of enlightened administration will begin to haunt the mind of the musing pedagogue, now that the schoolmaster, in his wanderings abroad, is beginning to find his way into Parliament as the successful winner of forlorn hopes. Upon these fancies, however, we must not now dwell, but content ourselves with once more heartily congratulating both the teacher trio and the teachers themselves upon the notable triumph that the General Election of 1900 has vouchsafed to them, and with wishing success to the efforts we know our members will make on behalf of all practical teachers—efforts that must succeed, for are we not told that a threefold cord is not easily broken?

Next Month:
OUR ILLUSTRATED GIFT-BOOK SUPPLEMENT.

GEOGRAPHY IN ELEMENTARY SCHOOLS.*

BY T. G. ROOPER, H.M.I.

Defects of Earlier Method.

IT cannot be denied that of all the subjects which belong to elementary education, there is none which is more attractive than geography. It is almost the only one, except what is called the science of common things, which keeps the teacher and scholar in touch with new discoveries and fresh developments.

Yet geography remained for a long time one of the dullest of subjects, because it consisted in learning by heart lists of mountains and rivers, with their heights and lengths, often without even the identification of their locality on the map.

To make a subject interesting, details must be presented in relation to each other. One fact must be dealt with in such a way as to explain another. As Professor Mackinder has said, the teacher's aim should be to show not only "where," but also "why."

The defects of the old methods of teaching geography may be summed up as follows:—

First, geographical learning was not based upon object teaching, but upon names and numbers, which had little meaning for the child, and no interest. A pitman in the north of England, looking at a poster which advertised a course of University Extension Lectures on the Age of Elizabeth, was heard to remark, "Age of Elizabeth! well, I'm blessed if I care how old she was." Many a child in former days had the same kind of feeling about the length of the Yang-tse-Kiang. The facts were as dead as a skeleton, and could communicate no vital force to the intellects of the scholars.

Secondly, whereas the key to the understanding of the rest of the surface of the earth is to be found in the study of that part of it which adjoins the child's home, this fact was quite ignored. Observations made by the child, under guidance, will enable him to use the words hill, plain, stream, and the like, with some meaning behind the term. So, too, by watching the varying height of the sun, the changes of the seasons, the rainfall, the first appearance of familiar birds and flowers, the rise and fall of the tide, and such matters, the child can lay a sure foundation for the intelligent study of more advanced geography.

Thirdly, the map was supposed to speak for itself. Little attention was paid to the interesting and important art of map reading. The truth is, that to the untrained eye a map is a confused mass of lines and names and colours. As Shakespeare says, "He laughed till there were as many lines in his face as on the Map of the World, with the Indies added."

Fourthly, there was not sufficient introduction to the construction and use of the map. Children should be shown how to record on paper the direction and length of short walks. They should be taken to commanding views, and shown how to place, according to the compass, some of the chief features in the landscape. They should learn to pass from observation of nature to modes of representation of nature, and they should feel the need for marks to represent hills and rivers and towns before they study elaborate maps. They should pass, in short, from the object to the symbol or diagram of it.

Fifthly, the children's studies were almost exclusively confined to political geography, and too little attention was paid to physical and astronomical geography, which are the basis of the other. Boundaries of states change; the form of the earth abides.

Sixthly, geographical details were not sufficiently connected as cause and effect, and they were not regarded from various points of view. Each country which is studied, although no great amount of detail is really needed for the purpose, should, when the study is complete, present to the scholar a connected whole.

Seventhly, a great many details were learned by heart which really had no value whatever to the beginner—as, for instance, the names of all the rivers that flow off eastwards from the Scandinavian mountains to the Baltic Sea.

Progressive Course Based on Object Lessons.

The systematic and continuous study of geography should be deferred till the child is eight or nine years of age. Before this stage, coloured or other pictures of England and foreign countries may be shown, and romantic stories of adventures by land and sea may be told or read, and attractive poems like "Ralph the Rover" may be recited or read to the children, and talked over. Walks may be taken, and the geographical features of the country may be pointed out. The sunrise and star-rise may be watched, and the beauty of brooks, rivers, and the "innumerable laughter of the sea" may be enjoyed as opportunity permits. When a child is eight or nine years old, however, the study may become more precise. By use of slates or paper ruled in squares, and by taking a side of a square for a foot or a yard, the child may learn to construct a plan of the classroom to scale, and also to make such measurements of the walls as are necessary for the purpose. I think work of this kind, on square-ruled paper, although simple, is of very permanent value, and that it is fruitful learning, because it suggests numerous useful applications of itself later on.

An excellent book on teaching geography through object lessons, by Mr. Frew (Blackie), shows how children may learn to make graphic records of short walks or even longer expeditions. That a plan shows size and shape and direction, and that a line carefully drawn from point to point as the direction of the walker changes may record the turns he takes in the course of a long walk, are facts worth mastering, and not really hard for a child to master if taught in a practical way, by doing, and not by reading.

The next best help to the understanding of the right use of geographical terms is a relief map or model of the locality of the home. Along with the model there should be a photograph of it, because this forms an admirable introduction to the idea of a map. The difficulty of the map-maker is to indicate on a flat surface the relief of the land. The difficulty of the child is to think how a flat surface like a map can possibly indicate a mountainous or hilly country.

The third stage after the use of the model and the photograph of it is the pictorial map, or bird's-eye view; and the last stage is the ordnance map of the same district. For young children, as for newspaper readers, a bird's-eye view is an excellent introduction to a real map. Some may say that this careful gradation of difficulties, and this presenting them one at a time, are unnecessary. They are wrong. Clearness of apprehension and clearness of thought are gained in early years by this slow and methodical practice. For want of it great mistakes are often made by men of undoubted ability.

Children can learn from a model of their county most of the important geographical terms in a concrete form.

Such a model presents the various types of elevated land, such as the isolated hill, ranges of hills, masses of high land, passes in ranges of hills and valleys, and ways of communication. It enables the beginner to obtain a clear idea of rivers, and not merely rivers, but river basins. Watersheds also are easily studied, and similar facts.

By suitable questioning, based upon the model, reasons can be drawn out for the appearance of a town in a particular situation. The idea that there is little that is really arbitrary or matter of chance even in the site of a town or village may be well developed, and simple ideas of reasoning conveyed in an effective way, even to young children.

Geography is the study of the earth as the stage on which the drama of the human race is played out; hence traces of former inhabitants can be noted, with a view to connecting geography with history. The difference in climate between different parts of the district may be noted and explained. Where the hills catch the Atlantic winds and condense the moist air into vapour; where the downs form pasture for sheep; where the lower-lying sands and clays bear forests, and where the earliest flowers and fruits appear—such fundamental facts as these are hard neither to observe nor to understand.

* A paper read at the British Association meetings, Bradford.

Map Reading.

This now brings us to the foundation of all real study of geography—namely, the wall-map.

The scholar so far has proceeded after the following method: first, observation; second, description; and third, representation. First the eye, then the lips, and lastly the pencil. He has learned to use his eyes; he has learned to describe what he sees in correct terms, and by using complete sentences; and lastly, he has learned how geographical details can be represented on paper. A map should no longer be a dead and mute mass of lines, colours, and names, but a living and speaking interpretation of natural facts.

In studying the wall-map of England, it is a great advantage to have a graduated series, in which one set of facts is presented at a time. The first of the series will be purely physical, showing hills and rivers; the next map may show counties, towns, and railways; the next, industrial or economic facts and easy statistics. It is a great pity that we have not a few boldly-drawn historical maps of England, for use in elementary schools, showing England under the Romans, Anglo-Saxon England, and mediæval England.

Of course there comes a time when the scholars must pass from what they themselves can observe and record to what others have observed and recorded. The great difference between mediæval and modern education lies in this, that whereas in the Middle Ages the teacher omitted all this basis of observation and commenced at once with communicating to the child the experience of others, so that all was taken by the learner on trust, and an uncritical habit of mind was cultivated, at the present time the best schools attempt to base their teaching on the direction of the child's individual faculties and means of acquiring knowledge. The wall-map is a record of the observations of others, and the child can only properly understand it if he has made and recorded similar observations for himself.

Now there are wall-maps and wall-maps. If the map is to be the interpreter of nature, it must interpret nature correctly: every line must have a meaning. It is not good enough if it gives merely the political divisions, with a few vague indications of mountain chains, but without delineation of highlands and lowlands, peaks and passes, watersheds and valleys.

Map reading, which is the proper use of the wall-map, is a kind of reversal of the process of the study of home geography. In studying home geography, the child begins with a natural fact, such as a river or a hill, and learns how to represent its position and character on paper. In reading a wall-map, the scholar begins with the symbol or representation of natural facts, such as watersheds and valleys and mountains, and by means of them works his way to the natural fact which such symbols represent. Hence the extreme importance of the right study of home geography. The symbols on the wall-map are vague and meaningless unless a content and significance are given them by the previous study and practice of the building up of local plans and maps. The pupil must learn to translate the symbols of the wall-map back into the forms of nature which they represent.

The teacher can then, if he have the use of a good wall-map, by judicious questioning, direct the scholar's attention to noteworthy physical and other facts, and lead the scholar first to observe, and then to draw inferences from what he observes.

This kind of analytical study of a map is easy enough if the map is really good. If, for instance, the rivers are marked in their course up to their true source, if passes in mountain ranges are shown, if river basins can be made out, then the child need not be told that the Rhine rises in Mount St. Gothard; he can quickly find it out from the wall-map, under the guidance of a developing question. Similarly, the termination of the North and South Downs in two headlands—namely, the South Foreland and Beachy Head respectively—can easily be discovered by the child himself, if aided in the manner described.

Gradually the child acquires skill in drawing inferences, and thus he continues to proceed by the triple process of observation, description, and representation, much as he did when studying home geography. By observing the map, the child may be helped to infer much about the level and vertical forms of land which he has never seen, together with its river systems and its topography. He may also learn to infer the main character of the climate and the consequent productions of the soil.

The first wall-map that the child will study carefully will be that of the country in which he lives; not, of course, that even the younger children should never be shown a wall-map until this stage is reached. On the contrary, even the youngest children may look at a globe and a map of the world showing the British possessions, and a map of England. Before beginning the systematic study of a subject, it is useful to learn something about it in an informal way; the study of geography may be imperceptibly introduced, and first glimpses may anticipate more thorough inspection.

Besides the hills, rivers, counties, and towns of England, a few striking facts of exports and imports should be introduced by aid of Whitaker's *Almanac* or Sell's *Commercial Intelligence*, a few contrasts of rainfall east and west, and a few facts of historical geography. In this way a child early learns the existence of the various branches of the subject—namely, of physical, political, historical, and commercial geography, and the kind of differences between them.

Tables may be made in which the trade of a few towns is set out in a graphic way, and thus curious facts come out—as, for instance, that London imports more than twice as much as Liverpool, but only exports half as much.

Graphic Exercises.

This leads up to the mention of the value of *graphic work* in geography. The first branch of graphic work is, of course, drawing maps. Where the teacher requires a more or less interesting exercise in drawing and tinting, the scholar may practise copying on a large scale a map of Europe or any country as a whole. Such map drawing, however, does less than might be imagined for the study of geography. Map drawing should be a form of object teaching. What is object teaching? It is the employment of all the possible means by which the learner may acquire an exact conception of an object, whether this conception is a mental image, or, in more abstract studies, what may be called a whole of reasoning. The use of map drawing should be much the same as that of making diagrams in other studies. For instance, in studying physiology, a carefully-drawn muscle or nerve or gland in a diagrammatic form is much clearer to understand than the confused mass of flesh from which it has been dissected and copied. The map, then, should not be drawn by the scholar before he has studied the wall-map with the greatest care.

Secondly, each map which the scholar draws should serve some definite purpose. For instance, his sketch-map may show that he can trace on the map and set down on paper the basin of the Thames or the Ganges; or it may show the directions of a journey from London to Madrid, and the relative positions of the leading towns on the way, which is a kind of elementary traversing; or it may show the disposition and arrangement of the cotton towns around Manchester, and the like. In most cases these sketch-maps are best worked out in conjunction with the teacher, but the teacher's sketch-map should never supersede the observation of a good wall-map. It is impossible for sketches to be as accurate as the wall-map, and, apart from wall-maps, sketch-maps encourage vagueness instead of leading to precision. The sketch-maps should proceed from simpler studies to more complex ones. No one should attempt to draw a map of a country as a whole until the leading features have been dealt with separately. Analysis should precede synthesis.

Then, again, while maps should be as neat as possible, they should emphasise the important features. For instance, in English maps of the Pennine Hills the marked depression between the Aire and the Ribble is seldom indicated, yet this has determined the course of the Leeds and Liverpool Canal and of the Midland Railway; and some maps made in Germany show it quite clearly, but not always those made in England. It is only when the sketch-map is thus employed to simplify the real map, and in close connection

with it, that it can be considered object teaching. Map drawing, then, should be a constructive exercise, and not mere copying. It should be the external presentation of a mental conception. It should not be a part of a process of learning by memory, but rather a means of proving that a right impression has been obtained.

In drawing sketch-maps the details should be simplified with consideration, so as to emphasise salient features. For instance, in sketching the Rhine or Danube, only the leading bends need be attended to, and towns or tributaries associated with them should be emphasised. A good basis for a sketch-map is a cross, consisting of a meridian of longitude crossing a parallel of latitude, both carefully chosen, such as those constructed by Mr. A. Gardner.

Map drawing is not the only form of graphic geography. Striking statistics of trade and commerce can be made clear by the use of paper ruled in squares, and those who teach commercial geography should proceed some way with exercises of this kind. "Graphic illustrations," says Quetelet, "often afford immediate conviction of a point which the most subtle mind would find it difficult to perceive without such aid."

Connection with History and other Studies.

The principle of the correlation of studies should not be neglected. Of course the principle should not be pushed too far, but by a judicious application of it one study may reinforce another instead of forming a distraction to it. While, for instance, England is being studied in the geography lessons, and especially the counties, let the early period of English history be read, which explains their formation. Also let some of the pieces for recitation illustrate some of the scenes which are described in the geography lesson. Let, for example, Kingsley's beautiful lyric, "Go, Mary, call the cattle home, across the sands of Dee," be learned when Cheshire is studied.

Simple records of rain and temperature and wind, and the first appearance of birds and flowers and fish, throw much light on climatology. Object lessons also help the understanding of the circulation of water, the formation of ice, glaciers, and icebergs. In some schools interesting records could be kept of the tides, and the temperature of water at different times of the year, whether in the sea or in rivers or springs, and similar facts which bear on climate.

Much spirit is awakened in young students of geography by school expeditions for practical work. Such expeditions are growing more common in England, but the following account of the organisation of school expeditions as they have been made in France is worth attention.

Description of Geographical Excursions in French Schools.

The scholars in some French schools carry with them on such expeditions all that is necessary in a handy form, but no more than is necessary, and the cost is reduced as far as possible; and they learn to make themselves at home wherever they find themselves. The arrangements described are made for children between the ages of ten and fifteen.

Each scholar, and of course also each adult, taking part in the expedition carries a canvas bag—if waterproof, so much the better—containing a plate made of unbreakable material, and a cup, a knife and fork, and spoon, and a small towel or napkin.

There are three types of expeditions, according to the time devoted to them.

The first consists of a short day's walk into the hills, forests, or other places where there are no houses or inns to be met with. The scholars take provisions for the day in their bags, along with the other things above mentioned.

In the second type of expedition, somewhat more comfort, not to say luxury, is secured by hiring a horse and cart to accompany the expedition. In this way more substantial food can be taken, and also urns and kettles for making tea. Aided by a cart, the expedition can cover more ground.

The third type of expedition is one which extends over at least one night, and it may be for several nights.

The details of this kind of expedition have to be carefully thought out and prearranged. The chief conductor places himself in communication with teachers of the schools in the places in which he intends to stop for food or lodging. The principal meal is thus ordered beforehand at a given hour. The payment is made either at so much per head, which is always rather expensive, or the materials are ordered and paid for, and the trouble of preparing them remunerated separately. The party may well dine in a shed or barn, and undertake much of the trouble of arranging the meal, and thus save labour, which means money.

The cost of sleeping arrangements is reduced by the following means:—

Each scholar has two sacks—one made of mattress cloth, which is open down the side, and capable of being laced up, in order that it may be filled with straw. Straw is not spoiled by being used once for this purpose. The other sack is made of coarse cotton, into which the sleeper can insert himself in order to lie warmly and comfortably on the other. Sybarites can make a pillow by wrapping up some straw in their towel.

In the expeditions which extend over one night, the scholars carry in their knapsack, as well as their cup, plate, etc., as before mentioned, some soap, a tooth-brush, and a comb. The morning toilet is made in the open air. Head, neck, and trunk to the waist are rubbed and scrubbed either at the pump, if at hand, or in a river.

The sleeping-sacks, and, in the case of prolonged expeditions, the necessary change of linen, are either conveyed in a cart accompanying the party, or sent forward by train.

The excursion is planned beforehand with a certain amount of elasticity, so that any chance occasion of special interest may be taken advantage of, or any breakdown made good, without much confusion or disorganisation.

The map of the route is carefully studied. The best for use is one which shows the contours. Our English ordnance coloured contour maps are the envy of the French. It is a good plan to place a sheet of glass over the map and trace the route upon it. Another way is to make a map of the route, and multiply it by any manifolding process, and provide each member of the party with a copy. The scholars discuss their route beforehand, both under the guidance of their teachers and among themselves. There is first the physical geography of the country to consider, and then the natural history, places of interest, industrial facts, and the like.

During the expedition, time is found for practice in traversing with a prismatic compass, for using the barometer, the pedometer, the pocket sextant, and the Abney level. Suitable apparatus is also taken for studying the flowers, and the nature of the soil and rocks and fossils. Of course there is also a small pharmacy and ambulance in case of wounds, indisposition, or similar accidents.

The speed of progress varies. Sometimes the party saunters along looking carefully at various objects of interest, scenery, flowers, birds, and cultivation of land, and taking notes; sometimes it marches at a steady pace, making straight for some goal. The way in the latter case is much enlivened by music, either by singing school songs or by a small band.

It only remains to add that before starting the party is carefully drilled in packing their knapsacks, in making their straw couches and unmaking them, and putting them away in the assigned place.

Expeditions like this have been made during the summer holidays, and as many as fifty scholars have spent as much as fifteen days on a tour. On one occasion some sixty scholars made a week's tour in Belgium. Such expeditions strengthen the body as well as the mind, and girls as well as boys take part in them. It is to be wished that they should be undertaken in this country as they are abroad.

Local Geographical Societies.

In conclusion, I will give a brief account of the Southampton Geographical Society, because I hope to prove by it that for promoting and deepening the interest in the study of geography there is no more excellent way than to establish similar local geographical societies, if possible, in connection with the Royal Geographical Society. Such societies have been formed at Liverpool, Manchester, and Newcastle. The Royal Scottish Geographical Society is, of course, not ade-

quately described as local; it is imperial. The work of these societies is well known, and the efforts made by the Manchester Geographical Society to encourage the study of geography in day and evening schools formed the subject of an interesting paper which was read before the British Association in 1896, under the title of "Practical Geography in Manchester."

The youngest of these societies is the Southampton Geographical Society, and a brief account of its aims and mode of working will, it is hoped, be of interest to the members of this section.

The Southampton Geographical Society was founded in 1897. The aim of the society is chiefly educational; its purpose is to acquire and diffuse geographical knowledge in the town and district by uniting the efforts of all who are interested in the science of geography. In the first place, lectures are held periodically from October to April. These are of two kinds. Those which come before Christmas do not form a continuous course, but are given by travellers who have visited foreign countries and are able to spread information which they have obtained at first hand. The stimulating effect of such a lecturer's words influences the minds and hearts of the students as no amount of accumulation of learning by reading books can ever do. The society has enjoyed the privilege of hearing, among many others, Mrs. Bishop on the Yang-tse River, and Miss Kingsley, whose heroic death is still so fresh in our memories, on West Africa. Mr. V. Cornish has shown us how to study the waves of the sea and sand waves. The Chamber of Commerce in Southampton has also helped to supply lecturers. The second portion of the session, between Christmas and Easter, is devoted to a continuous course on some special branch of geographical study. Dr. Mill has lectured on the principles of geographical instruction in special connection with British colonies. Mr. Dickson has lectured on the physical geography of the oceans, and recently Mr. Herbertson has treated of South Africa. A special feature of the society is the attempt which is being made to carry out the suggestion of Archbishop Benson which he made at a missionary conference at St. James's Hall in London in 1894. "The scientific study of missions," he said, "is a thing which is beginning, and could only begin after people in general had got some idea of the philosophy of history. The business of the great missionary societies has been to plant the faith. The scientific study of the results of their work as a great historical subject, revealing a view of the enormous importance of the idea of missions, such as has been thought out by Mr. B. Kidd, is work for thoughtful people who desire to form sound and philosophical conceptions of what missions really mean in the evolution of human society."

This is a copious and generous study for those who wish to know something of the place of missions in current history, whereto they are growing and how they may be helped, and, it may be, where they have made mistakes. It is the business of the wisest and most thoughtful, of the most experienced and well read, to develop and propagate this study. In accordance with this suggestion, the society has listened to a paper from the Archdeacon of Trinidad, upon the general geography and the social and industrial condition of the island as it is to-day, with special reference to mission work and its effect on the negroes. The winter session, then, is devoted to lectures. During the summer months expeditions are arranged for the purpose of studying geography in a practical way.

Day expeditions are made to places in the neighbourhood. The company divides itself into groups, each group being in charge of a competent guide. One group, in charge of a late member of the Ordnance Survey Office, maps out, by aid of a prismatic compass, a track of a small area in the New Forest. Another group devotes itself to the forest trees in the same area, another to the botany, and another to the insect life. At the end of the day the company meet together, and the various guides give a brief report of the results of the day's proceedings.

In some cases these expeditions take the form of an object lesson in illustration of some part of the spring course of lectures. For example, after the lectures on the ocean by Mr. Dickson, the society hired a steamer, and, under the guidance of Mr. Garstang of the Plymouth Marine Laboratory, an expedition was made to the Solent, in the course of which a comparison was made and tabulated of the results of investigations into two stations—one in the Solent off Spithead, and the other off Netley, in the brackish tide of the Southampton Water. The temperature and density of the water at varying depths were ascertained by use of the deep-sea thermometer and the water-bottle. The fauna and flora of the surface and the bottom were explored by a fine silk tow-net and a trawl. The results of this expedition, besides profoundly interesting the company, proved of some scientific value to Mr. Garstang.

The society is also promoting the publication of a set of maps of the county for use in schools, which will show, in bold and not too minute rendering, its—(1) physical geography; (2) geology; (3) archæology; (4) history; (5) industries. It is also collecting a library and sets of lantern slides, etc.

The inaugural lecture of the Southampton Geographical Society was given by Sir Clements Markham, who, in an address which kindled in the audience something of the enthusiasm with which he is himself inspired, laid down the lines on which it has been attempted to work the society. In wishing it all success, he gave a cordial welcome to the members, and offered them the privilege of consulting the library and the map-room of the Royal Geographical Society, together with special opportunities of attending lectures and purchasing publications.

A widely-spread interest in the study of geography seems almost indispensable to the administration of this great empire. The century dies, as it was born, amid the clash of arms. The operations of war are in everybody's thoughts. Is it not an assured fact that at the commencement of the war in South Africa our maps were sadly inadequate, and that for want of better ones the movements of our troops were seriously hampered? There are two points in connection with this defect which are germane to the subject of geographical instruction.

In the first place, the early mapping of a country depends largely upon surveys of farms and holdings. If boys learned at school how to measure and map land, the surveys of farms and estates in new countries would be much more useful and reliable.

Secondly, we are told that the interest in ordnance work in this country is so slight that the nation would not be prepared to sanction the expenditure of money on mapping our colonial possessions. If the interest in the study of geography were half as widely disseminated as the interest in sport, the country would be keen to provide good maps of its foreign possessions. The expenditure would not be grudged, and it would not be necessary to wait for calamity in war before the chief details of each part of our vast territories were mapped with sufficient accuracy.

Similarly, a knowledge of the work which is being done by the Plymouth Marine Laboratory, with its almost surprising possibilities of aiding fishery and even meteorology, would secure public approbation, and a readiness to devote public funds to its extension. In the same way, exploration of the unknown parts of the globe, such as the Antarctic Ocean, would command ungrudging financial support, as what people are interested in they are ready to pay for.

The establishment of similar societies in all large centres would conduce to the progress and welfare of the British Empire. May their number increase and multiply.

Teachers' Guild Autumn Meetings.—The following lectures are announced in connection with the Metropolitan Section B of the Teachers' Guild of Great Britain and Ireland:—Monday, 29th October, at 8 p.m. "The Heuristic Method of Teaching Science." Professor Armstrong, F.R.S. At the Mercers' School, Holborn, E.C.—Friday, 16th November, at 8 p.m. "A Modern Educational Reformer—Robert Herbert Quick." John Russell, Esq., B.A., of University College School. At 37 Gordon Square.—Friday, 7th December, at 8 p.m. "The Government's Secondary Education Act." The Hon. E. Lyulph Stanley, Vice-Chairman of the London School Board. At the North London Collegiate School for Girls, Sandall Road, N.W. A cordial invitation to Professor Armstrong's lecture is extended to the readers of THE PRACTICAL TEACHER by Mr. J. H. Garside, hon. sec.

THE PRACTICAL TEACHER AT PARIS.

THE "CONGRÈS INTERNATIONAL DE L'ENSEIGNEMENT PRIMAIRE."

BY OUR SPECIAL CORRESPONDENT, MONS. P. MIEILLE OF TARBES.

AS an ex-primary teacher and master in a training-college, all the questions concerning *l'enseignement primaire* have kept for me the kind of home fascination that we are bound to feel for the youthful ideas and associations of *la vingtième année*. I often think that former labours as an elementary teacher have left their mark on my subsequent career, and, at least, do I hold myself indebted to them for the larger sympathy which I am enabled to bring to bear on my present relations with our primary colleagues.

I hope our readers will excuse me for this bit of French personal reminiscence. It was less meant to propitiate than as an explanation of my position with respect to primary teaching, and of the views I hold with a certain number of my secondary colleagues on this all-important subject—namely, the union of all teachers in the bonds of true brotherhood, and the co-operation of all in bringing about the overthrow of national differences and international prejudices.

Be that as it may, the "monster Congress" of primary teachers, as it was not inappropriately called, was not the least successful of the series. Well could it be said of the throng of primary teachers that crowded the halls of the Sorbonne, "Their name is legion!"

Over two thousand members of *Congrès* gathered on the 2nd of August in the Grand Amphitheâtre of the Sorbonne to hear the presidential address of Rector Gréard, and to cheer the eloquent welcome he addressed to the foreign guests. It is chiefly to the high authority of this illustrious Frenchman—a true "chief of teachers"—to his large-minded comprehension, quick-witted lucidity of exposition, that the satisfactory working of so large an assembly is largely due.

The following were the questions submitted to the votes and proposed for the discussion of the Congress:—

First question—De l'éducation scolaire ménagère (domestic economy): sa définition, ses limites, son adaptation à chacun des degrés de l'enseignement primaire.

Second question—De la fréquentation scolaire.

Third question—De l'éducation morale: son objet, ses principes, ses méthodes et ses procédés.

Fourth question—De l'enseignement primaire supérieur: son objet, ses limites; moyens de l'adapter aux intérêts régionaux et locaux.

Fifth question—Des Institutions post-scolaires: cours d'adultes; conférences et lectures publiques, etc.

Immediately after the presidential address, the members divided into five sections, and work began.

Each section dealt with the particular question allotted to it, elaborated the materials supplied by the "Memoirs" and preliminary reports, and finally brought before the full meetings of the whole *Congrès* sets of proposals and resolutions which were carried at once, or were debated upon again before the final vote.

On the first question thirty-three "Memoirs" had been sent. Although our English colleagues have little to learn from us in the matter of domestic economy, as is amply demonstrated by the splendid exhibits at Paris of the London School Board, a few notes relating to the discussion may not prove uninteresting. We French are rather proud of our housewives (*ménagères*), and the large number of lady-teachers of foreign nationality who graced the debates is a conclusive proof of the interest raised by this question—a good sign of the times—in the feminine teaching community.

The need for methodical teaching of domestic economy in all girls' schools seems to have been unanimously recognised. A good housewife is a priceless treasure. "To form such is the greatest benefit that education can confer on the family, the community, and the nation." Another report says: "A good housewife will multiply twofold and threefold her husband's earnings; she will know how to beautify his home and wean him from the public-house." Another again: "The teaching of domestic economy ought to be introduced in boys' as well as in girls' schools. Is it not proper and fit to teach the boys that the head of the family is bound to give the example for work, sobriety, economy—that to the father the wife and children must look up and find in him the help and advice needed?"

Among the conclusions voted, I notice two:—

1. The teaching of domestic economy should be compulsory at every stage of primary instruction, from the infant school to the training-college.

2. Domestic economy might be introduced into boys' schools, allowing for the necessary differences in the point of view and in the end to be attained.

One of the most eminent of Paris municipal magistrates, M. Mayor Beurdeley of the eighth arrondissement, presided over the second section. This section, together with the third, secured the most numerous attendance, and witnessed the best oratorical efforts of the whole *Congrès*, the question treated being indeed of paramount importance to the future of primary teaching. The percentage of scholars actually following the courses of primary schools was said to be, in the words of a high authority in pedagogy, "la mesure du prix que l'on attache à l'instruction et du profit que la jeunesse en retire."

Compulsory attendance has not given in France, as yet, all the good results one had a right to expect from it, and in that respect English statistics show a state of things still less satisfactory. In Germany alone is *la fréquentation scolaire* all but perfect.

A few statistics will, perhaps, not be amiss. In 1877 the situation in French elementary schools was deplorable. Out of 4,502,894 children between the ages of six and thirteen—the legal school age—only 3,878,151 were registered as attending school. In 1882 the respective numbers were 4,586,894 and 4,425,690. In 1887–1888 the attendance rose to 4,752,968. But since that time there has been a falling off, and in 1900 about 4 per cent. of our children are said to escape altogether the duties of compulsory attendance; that is to say, about 171,215 children from six to thirteen are defaulters.

Is it to be wondered at that, when in Paris alone there are 15,000 children not frequenting school, the efficacy of the legal machinery devised to secure compulsory attendance should have been called in question and seriously condemned?

Facts, commissioners' and inspectors' reports were brought before the Congress showing the extent of the evil, together with the egregious inadequacy of the actual legislation to cope with it. In some parts, from 12 to 15 per cent. of the children were absent from school. And no help is forthcoming from the *Commissions Scolaires*, none from the communal authorities.

The second section proposed, and the *Congrès* adopted, the following resolutions:—"Une modification du régime de la loi de 1882 s'impose dans l'intérêt de la fréquentation scolaire." "Que les commissions scolaires soient déchargées de toute mission relative à l'application des pénalités, et que leur pouvoir répressif soit transféré au juge de paix."

As to England and Germany, a greater contrast could not be found than between these two.

The number of defaulters is practically nil in Germany. The compulsory attendance law is very strict, and severely applied to refractory cases. The consequence is, that whereas in most parts of Germany not one child is absent, the percentage of absentees is for the whole country 0·11 per cent. And the number of illiterate recruits is remarkably small—only twenty-one in the breadth and length of the Fatherland.

Inspector Dunn's report was a mine of facts, and it afforded ample proof of the painful interest excited by this question of *la fréquentation scolaire* among our English brethren. The derelict million Sir John Gorst speaks of are a living reality, and appeal to the best practical side and earnest zeal of all who would see England in her proper place as an enlightened and enlightening country.

On the third question—Moral Education—forty-four "Memoirs" had been sent up, and furnished material for

animated discussion. It was easy to see that some of our foreign friends were rather surprised at the strictly *laïque*—if I must use the French word—spirit in which the Congress was determined the question should be treated.

The Congress was only faithful to its institution in maintaining outside the pale of discussion the neutrality of French primary teaching. The following definition of moral education was unanimously agreed upon: "Moral education aims at forming honest men and good citizens." And in the following manner the teaching of moral education in the primary school was characterised: "L'enseignement de la morale s'appuie sur la raison, c'est-à-dire sur la conscience éclairée. Il s'applique à développer chez l'enfant les sentiments de sincérité de justice, de bonté, de solidarité. Il est identique pour les jeunes gens et pour les jeunes filles. Il est indépendant de toute confession religieuse sans s'opposer à aucune."

And finally it was voted that:—

"Moral instruction is in the first rank among the subjects taught in the elementary school. It is given every day by means of a lesson or a familiar conversation. It permeates all the other subjects."

This deep sense of the importance and necessity of moral education and moral teaching, so strongly manifested in the work of the third section, so warmly approved of and so enthusiastically carried in the full meeting of the Congress, cannot be insisted upon too much, nor too warmly commended.

I shall pass rapidly over the work of the fourth and fifth sections. The fourth question, on which no less than forty-six "Memoirs" had been sent, is one that is fairly familiar to every English teacher, and remains one of the problems of the hour in England as well as in France.

That the instruction imparted in the elementary school is only a minimum, and ought to be supplemented for a large minority of elementary pupils by a subsequent course of instruction of two or three years' duration, is gainsaid by none. But what is that instruction to be? and how is it to be given?

The account given by the French of their *écoles primaires supérieures*, of their *écoles pratiques*, *écoles de commerce et d'industrie*, by the Germans of their flourishing technical schools, etc., is fruitful in good lessons, and therein results many a practical hint that will not be lost.

I will point out to our readers that the French conception of *l'enseignement primaire supérieur*, as distinct from technical instruction, is more in accordance with the general spirit of improvement of the age than any other national system.

The *caractère désintéressé* of the teaching in our *écoles primaires supérieures* won the not undeserved praise of several foreign delegates. A large majority agreed in thinking that it was a mistake to specialise too early, the more so that a good substratum of general culture is still the best preparation for technical instruction, be it commercial or industrial. Several teachers of technical schools even complained of the raw state of a large percentage of their recruits, and of the time lost in consequence.

The conclusion was that: L'enseignement primaire supérieur a pour objet d'assurer un complément d'éducation générale aux jeunes gens ayant terminé leurs études de l'école primaire élémentaire. Il différera de l'enseignement donné dans les écoles pratiques de commerce et d'industrie, en ce que le développement des diverses facultés de l'adolescent restera sa grande préoccupation, et qu'il ne sacrifiera point la culture intellectuelle et morale à l'apprentissage professionnel. That is to say, the man before the workman.

The fifth question—*institutions post-scolaires*—had already, in part at least, been dealt with, in two other congresses—the Secondary Congress, and the Congress on Higher Education (*enseignement supérieur*).

The Primary Congress treated it in a most practical way. Adult schools, school-boys' and school-girls' associations, lectures, libraries, workmen's clubs, etc., were discussed, and a good deal of very interesting information was brought to the notice of the Congress on the working of such after-school or post-scholar institutions.

From the report of the eminent Inspector-General of Education, M. Edouard Petit, we extract the following statistics relating to French schools:—

Number of evening continuation classes (*cours d'adultes*) for boys	26,681
Number of evening continuation classes (*cours d'adultes*) for girls	11,610
Popular lectures	123,911
Boys' and girls' co-operatives	1,497
Boys' and girls' clubs	4,784
Expenses	641,400 frs.
Receipts	886,749 frs.
Grants from State, town councils, etc.	2,300,000 frs.
Grants from private sources	2,250,000 frs.

This rapid sketch of the work of the Primary Congress would be incomplete were I to forget the last resolution by which the international character of this teachers' meeting was deeply impressed on the final general assembly:—

"The Congress expresses the wish that, through the International School of the Exhibition, or the International Jury of Education, there may be established, between the different nations, a constant exchange of documents relating to popular education in all its shapes and manifestations."

Was not this resolution, greeted by the enthusiastic applause of the Congressists, a fitting termination to this international gathering of brothers in arms of the vast army of Progress? Was it not the signing of a bond of fraternity between the teachers of all civilised nations?

I shall write one word more. Has not international correspondence laid the foundations of, and secured to fifteen hundred teachers, by the agency of this journal, the benefits of such a bond of international fraternity? It seems to me that the interchange initiated by MM. Scheurmier, Buisson, and Colin, has already done much to bring home to many teachers—English, French, Germans, Americans—the manifold advantages of international exchange. Is it too much to hope that from this resolution of the Primary Congress may result an increase of international correspondents? Many French masters are desirous of entering into a friendly exchange with their English colleagues. Will all the readers of the PRACTICAL TEACHER answer the friendly challenge and enter our ranks?

GOOD NEWS FOR STUDENTS OF FRENCH.

A SIMPLIFIED SYNTAX.

CRUDITIES of spelling and syntax, however dear they may be to the examiner, are an abomination, and well it would be if they could be banished from the grammar books of all nations. Thanks to a committee over which M. Gaston of Paris presided, the Minister of Education has just issued a decree which goes far to free the French language from those subtleties which were simply so many stumbling-blocks to the intelligent student. We give a translation of the decree and a schedule of the reforms.

The Decree.—1. The forms of spelling set out in the appended list shall not be counted as mistakes when used by candidates at any of the examinations under the control of the Minister of Education, whether such examinations include a spelling test or not.

2. In all government schools and colleges, word forms and constructions contrary to those contained in the appended list shall not be taught as rules.

LIST OF REFORMS.

NOUNS.

Number.—***Témoin.***—When beginning a sentence, *témoin* may be either singular or plural, even when the substantive that follows it is plural—for example, *Témoin* or *témoins les victoires qu'il a remportées.* The expression *prendre à témoin* comes under the same rule, thus—*Je vous prends tous à témoin* or *à témoins.*

Singular or Plural.—In all constructions where the substantive-complement may be understood either in the singular or in the plural, it will be correct to use either number, thus—*des habits de femme(s); des confitures de groseille(s); des prêtres en bonnet(s) carré(s); ils ont ôté leur(s) chapeau(x).*

Nouns of two Genders.—1. ***Aigle.***—This substantive is usually masculine, although some classic authors use it as a feminine noun. Both genders will be allowed—for example, *un aigle* or *une aigle*.

2. ***Amour, Orgue.***—It is customary to make these words masculine in the singular. In the plural either gender will be allowed, thus—*les grands orgues ; un des plus beaux orgues.*

3. ***Délice, Délices.***—The first of these two really different words is rarely used, and is somewhat pedantic. It should be neglected altogether in elementary instruction.

4. ***Automne, Enfant.***—As both are of common gender, no special attention need be given to them, or to any other words of common gender.

5. ***Gens, Orge.***—The adjective agreeing with *gens* may be always feminine—for example, *instruits* or *instruites par l'expérience ; les vieilles gens sont soupçonneux* or *soupçonneuses. Orge* may always be used in the feminine, thus—*orge carrée, orge mondée, orge perlée.*

6. ***Hymne*** may be either masculine or feminine both for national and for religious hymns, thus—*un bel hymne* or *une belle hymne.*

7. ***Œuvre*** may always be feminine, thus—*une grande œuvre, la grande œuvre.*

8. ***Pâques*** may be used in the feminine either as denoting a date or a fête, thus—*à Pâques prochain* or *à Pâques prochaines.*

9. ***Période.***—This word will be allowed as feminine even when used in a special sense, and usually regarded as masculine, thus—*arriver à la plus haute période* or *au plus haut période.*

Plural of Proper Nouns.—In all cases a proper noun preceded by the plural article may take the plural sign, thus—*les Corneilles* as well as *les Grecques ; des Virgiles* (types) as well as *des Virgiles* (editions). The same will apply to the proper names of persons when used for their works, thus—*des Meissoniers.*

Plural of Foreign Nouns.—When such nouns have become thoroughly French, their plural should be formed in the usual way—for example, *des exéats* as well as *des déficits.*

Compound Nouns.—The hyphen is nowadays sometimes used and sometimes omitted with one and the same compound noun, and it is useless to bother children with contradictions that cannot be justified. *Pomme de terre* is as much a compound noun as *chef-d'œuvre*, for example; hence, although everybody will be free to conform to the old rules as to compound nouns, the following simplifications will be permitted :—

(*a*) **Nouns formed of a Verb and a Substantive.**—The two parts may be joined to form one word, the plural of which is formed in the usual way, thus—*des essuiemains, des abatjours, des fessemathieux, des goguepetits, des gardecôtes.* The two words should, however, be kept separate in such expressions as *garde forestier, garde général*, where the presence of the adjective clearly indicates that *garde* is a substantive.

(*b*) **Compound = Substantive + Adjective.**—The two may be joined, and the plural may be formed in the usual way, thus—*des coffres forts* or *des coffresforts.*

(*c*) **Compound = Adjective + Substantive.**—These may be treated in exactly the same way, thus—*des basses cours* or *des bassecours, des blancs seings* or *des blancseings, des blancs becs* or *des blancbecs. Bonhomme* and *gentilhomme* are excepted, because use has caused the middle *s* to be sounded; hence the ear teaches the rule, thus—*des bonshommes, des gentilshommes.* The apostrophe may be omitted from the words *grandmère, grandmesse*, and *grandroute.*

(*d*) **Compound = Adjective + Substantive, denoting a new object named after one of its qualities.**—The same rule applies, thus—*des rouges gorges* or *des rougegorges.*

(*e*) **Compound = two Adjectives, denoting a person or a thing.**—The two words may be written separately without a hyphen, each keeping its own inflections, thus—*un sourd muet, une sourde muette ; des sourds muets, des sourdes muettes ; une douce amère*, etc.

(*f*) **Compound = two Substantives in apposition.**—The two may be written separately, each keeping its own inflections, or they may be joined and form their plural by adding *s*, thus—*des choux fleurs* or *choufleurs ; des chefs lieux* or *des chefslieux.*

(*g*) **Compound = two Substantives, or Substantive + Adjective, of which one is really the complement of the other, without a particle to show the connection.**—The two may be joined and the plural shown as above, as—*des timbresposte, des terrepleins.* It seems better with respect to the words *hôtel Dieu* and *fête Dieu* to keep the parts asunder, but it will not be counted as a mistake to write *hôteldieu, fêtedieu.* As for the plural of these words and of *bain marie*, as well as of *trou madame*, the name of an obsolete game, there is no need to concern children with them at all.

(*h*) **Compound = Numeral Adjective + Substantive or Adjective.**—These may be written as one word, the second of the two parts carrying the mark of the plural, as—*des troismâts, des troisquarts.*

(*i*) **Compound = two Substantives joined by a Particle denoting the relation that exists between them.**—The parts are to be written separately, and each will carry its own inflections, thus—*un chef d'œuvre, des chefs d'œuvre ; un pot au feu, des pots au feu ; un pied d'alouette, des pieds d'alouette ; un tête à tête, des têtes à tête.*

(*j*) **Compound = various Elements derived from Substantives, Verbs, Adjectives, or Foreign Words.**—The parts may be either joined or separate. If joined, the last part bears the plural sign, thus—*des chassés croisé* or *des chassécroisés ; des fiers à bras* or *des fierabras ; des piques niques* or *des piqueniques ; des soi disant* or *des soidisants ; des te Deum* or *des tedeums ; des ex veto* or *des exvetos ; des vice rois* or *des vicerois ; des en têtes* or *des entêtes ; des plus (moins) values* or *des plusvalues ; des Gallo romains* or *des Galloromains.*

The peculiar word *sot l'y laisse* need not be considered at all; and, generally, it is useless to complicate elementary instruction with the plural of such compound nouns as *laisser aller, ouï dire*, which, by reason of their meaning, are never used in the plural.

The **hyphen** may always be omitted even when the parts of a compound noun are written separately.

THE ARTICLE.

Article before the Names of Persons.—The custom obtains of writing the article before certain Italian family names, as—*le Tasse, le Corrège ;* and even, erroneously, before the names of persons, as—(*le*) *Dante*, (*le*) *Guide.* Ignorance of this custom will not be counted as a mistake. Great uncertainty also prevails as to the manner of writing the article when it forms part of certain French proper nouns, as—*la Fontaine, la Fayette, Lafayette.* In dictating, the proper way of writing such names should be pointed out.

Article Suppressed.—When two adjectives are joined by *et*, and refer to the same noun in such a way as really to denote two separate things, the article may be suppressed before the second noun, thus—*l'histoire ancienne et moderne* as well as *l'histoire ancienne et la moderne.*

The Partitive Article.—*Du, de la, des* may be used before a substantive preceded by an adjective in place of *de*, as—*de* or *du bon pain, de bonne viande* or *de la bonne viande, de* or *des bons fruits.*

The Article before *Plus, Moins*, etc.—The rule requiring the use of the neuter *le plus, le moins*, before an adjective, to indicate the highest degree without comparison with other objects, is very subtle, and of little use. It is superfluous to concern oneself with this in elementary instruction; hence *le plus, la plus, les plus, les moins, les mieux*, may be used in such expressions as *on a abattu les arbres le plus* or *les plus exposés à la tempête.*

ADJECTIVES.

Agreement of the Adjective.—The agreement of the adjective will be permitted in the locution *se faire fort de*, as—*se faire fort, forte, forts, fortes.*

Adjective used with several Substantives.—When an adjective of quality follows several substantives of different gender, it may be in the masculine plural, whatever may be the gender of the nearest substantive, thus—*Appartements et chambres meublés.* Agreement with the nearest substantive will also be permitted—for example, *Un courage et une foi nouvelle.*

Nu, Demi, Feu.—These adjectives may agree with the substantive they precede, thus—*nu* or *nus pieds, une demi* or *demie heure* (without the hyphen), *feu* or *feue la reine.*

Compound Adjectives.—The different parts may be joined, and the single word thus formed will take the feminine and the plural signs, thus—*nouveaunée, nouveaunées, courtvêtue, courtvêtus, courtvêtues*, etc. But compound adjectives denoting shades of colours, having become really nouns in consequence of an ellipse, will be treated as invariable words, as—*des robes bleu clair, vert d'eau*, etc., just as we say *des habits marron.*

Invariable Past Participles.—Already the participles *approuvé, attendu, ci-inclus, ci-joint, excepté, non compris, y compris, ôté, passé, supposé, vu*, when placed before the noun to which they refer, are invariable, and *excepté* has even been received as a preposition; hence the agreement of these participles will be optional. The rules of agreement dependent upon whether these words are placed at the beginning or in the body of the sentence, and upon whether or not the substantive is defined, may be altogether ignored. Thus—*ci joint* or *jointes les pièces demandées* (without hyphen between *ci* and the participle); *je vous envoie ci joint* or *ci joints copie de la pièce.* The same rules apply to *franc*—for example, *envoyer franc de port*, or *franche de port une lettre.*

Avoir l'air.—Knowledge of the subtlety as to whether the adjective agrees with *air* or with the word denoting the person referred to will not be expected; hence it will be permitted to write either *elle a l'air doux* or *douce*, *spirituel* or *spirituelle*.

Numeral Adjectives.—*Vingt* and *Cent.*—The plural form of these words will be allowed even when they are followed by another numeral adjective, thus—*quatre vingt dix hommes*, or *quatre vingts dix hommes; quatre cent trente* or *quatre cents trente hommes*.

The **hyphen** may be omitted between the word indicating the units and the word denoting the tens, thus—*dix sept*. In expressing the number of the year, *mille* may be used in place of *mil*, thus—*l'an mil huit cent quatre vingt dix*, or *l'an mille huit cents quatre vingts dix*.

Demonstrative Adjectives. Indefinites. Pronouns.

Ce.—It will be allowed to join the particles *ci* and *là* to the pronouns that precede them without it being necessary to draw a distinction between *qu'est ceci, qu'est cela*, on the one hand, and *qu'est ce ci, qu'est ce la*, on the other. No hyphen will be required between the words in the latter construction.

Même.—After a plural noun or pronoun *même* may be in the plural; moreover, no hyphen will be necessary.

Tout may agree when placed before feminine nouns beginning with a vowel or *h* mute, just the same as when placed before feminine nouns beginning with a consonant or *h* aspirate, thus—*des personnes tout* or *toutes heureuses; l'assemblée tout* or *toute entière*.

Tout before the proper name of a town may agree without any regard to the subtle distinction that exists between *toute Rome* and *tout Rome*.

When a woman is supposed to be speaking, it will be permissible to say either *je suis tout à vous* or *je suis toute à vous*.

When *tout* is used indefinitely in the sense of *chaque*, both *tout* and the noun that it qualifies may be either in the singular or in the plural, as—*des marchandises de toute sorte* or *de toutes sortes; la sottise est de tout (tous) pays*.

Aucun with a negative may be used either in the singular or in the plural, thus—*Ne faire aucun projet* or *aucuns projets*.

Chacun.—When this pronoun follows the verb, and refers to a plural subject or object, either the possessive *son, sa, ses*, or the possessive *leur, leurs*, may be used after it, thus—*Ils sont sortis chacun de son* or *de leur côté; remettre des livres chacun à sa* or *à leur place*.

The Verb.

Compound Verbs.—Both the apostrophe and the hyphen may be omitted from compound verbs, thus—*entreouvrir* and *entrecroiser*.

The **hyphen** may be omitted between the verb used interrogatively and its pronoun subject, thus—*est il?*

Apparent and Real Subjects, as—*Sa maladie sont des vapeurs.*—Rules for such constructions cannot be taught. They should be studied only in the reading and explanation of the texts in which they occur. The question is one of style rather than one of grammar, and should have no place either in elementary instruction or in examinations.

Agreement of the Verb preceded by several Subjects not joined by the conjunction *et*.—If the subjects are not summed up by such a word as *tout, rien, chacun*, the verb may always be in the plural, as—*sa bonté, sa douceur le font admirer*.

Agreement of the Verb preceded by several Subjects in the singular joined by *ni, comme, avec, ainsi que*, and such-like locutions.—The verb may always be in the plural, as—*Ni la douceur ni la force n'y peuvent rien* or *n'y peut rien; la santé comme la fortune demandent à être ménagées* or *demande à être ménagée; le général avec quelques officiers sont sortis* or *est sorti du camp; le chat ainsi que le tigre sont des carnivores* or *est un carnivore*.

Agreement of the Verb when the Subject is a Collective Word.—Whenever the collective is used with a plural complement, the verb may agree with this complement, as—*Un peu de connaissances suffit* or *suffisent*.

Agreement of the Verb with *plus d'un* as Subject.—As it is customary to use the verb in the singular with *plus d'un*, the singular may be used even when *plus d'un* has a plural complement, thus—*Plus d'un de ces hommes était* or *étaient à plaindre*.

Agreement of the Verb preceded by *un de ceux* (*une de celles*) *qui*.—To decide in what cases the verb should be in the singular and in what in the plural is a fine point that need not be brought into elementary instruction or into examinations.

C'est, Ce sont.—In consequence of the widespread disagreement concerning the proper use of *c'est* and *ce sont*, and especially as the best authors have used *c'est* with a plural substantive, *c'est* may in all cases be used in place of *ce sont*, as—*C'est* or *ce sont des montagnes et des précipices*.

Sequence of Tenses.—The present subjunctive may be used in place of the imperfect subjunctive in subordinate sentences after a verb in the conditional, as—*Il faudrait qu'il vienne* or *qu'il vînt*.

Participles.

Present Participle and Verbal Adjective.—The general rule that the participle points to the action and the adjective to the state should be attended to. It will suffice for candidates to give proofs of common sense in dealing with doubtful cases; moreover, the teacher should avoid all subtleties in dealing with his class—for example, *Des sauvages vivent errant* or *errants dans les bois*.

Past Participle.—Authors and grammarians have always more or less objected to the rule as to the agreement of the past participle after *avoir*. Little by little the subject has been complicated: the exceptions have become numerous, according to the form of the object preceding the participle, the use of the verb in a literal or a figurative sense, and the dependence of other verbs upon the participle. Besides, the rules are falling out of use, and it seems useless to persist in artificially maintaining a rule which is a stumbling-block to teaching, an obstacle in the way of the development of intelligence, and which makes the study of French very difficult to foreigners.

There is nothing to change in the rule that demands that the past participle used as epithet shall agree with the word qualified, and that, when used as an attribute with the verb *être* or an intransitive verb, it shall agree with its subject, as—*Des fruits gâtés; ils sont tombés; elles sont tombées*.

But the past participle constructed with *avoir* may remain invariable in all cases where it has hitherto been made to agree with the object, as—*Les livres que j'ai lu* or *lus; les figures qu'elles ont cueilli* or *cueillies; la peine que j'ai pris* or *prise*.

Also with reflexive verbs the past participle may remain invariable in all cases where agreement has been expected, thus—*Elles se sont tué* or *tuées; les coups que nous nous sommes donné* or *donnés*.

The Adverb.

***Ne* in Subordinate Propositions.**—The use of this negative particle in a large number of subordinate clauses gives rise to complicated, difficult, and illogical rules often in contradiction with the custom of the most classical authors. The suppression of *ne* will be permitted in all cases, without regard to the fact whether the principal sentence is affirmative, negative, or interrogative, depending on such verbs and locutions as the following:—

Empêcher, défendre, éviter que, etc., as—*Défendre qu'on vienne* or *qu'on ne vienne*.

Craindre, désespérer, avoir peur, de peur que, etc., as—*De peur qu'il aille* or *qu'il n'aille*.

Douter, contester, nier que, etc., as—*Je ne doute pas que la chose soit vraie* or *ne soit vraie*.

Il tient à peu, il ne tient pas à, il s'en faut que, etc., as—*Il ne tient pas à moi que cela se passe* or *ne se passe*.

In the same way *ne* may be omitted after comparatives and words denoting a comparison, namely, *autre, autrement que*, etc., as—*L'année a été meilleure qu'on l'espérait* or *qu'on ne l'espérait; les résultats sont autres qu'on le croyait* or *qu'on ne le croyait*.

Likewise the omission may be made after *à moins que, avant que*, as—*à moins qu'on accorde le pardon* or *qu'on n'accorde le pardon*.

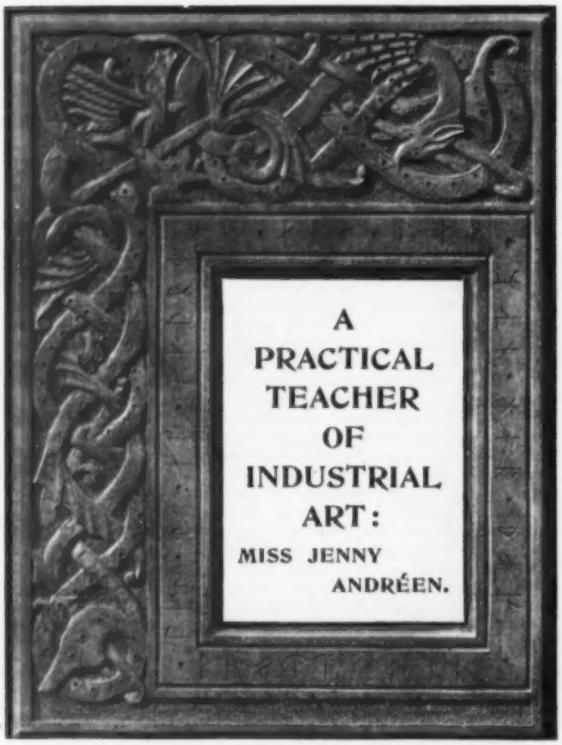
Note.

It is desirable in examinations not to regard as serious faults mistakes which prove nothing against the intelligence and real knowledge of the candidate, but only show a lack of acquaintance with some grammatical subtlety or shade of meaning. Notably the following should be dealt with very lightly:—(1) Substantives changing their gender according as they are abstract or concrete—for example, *garde, aide, manœuvre*, etc.; or those having a slightly different meaning according to their gender—as, *couple, merci, relâche*; (2) special and technical plurals—for example, *aïeuls* and *aïeux, ciels* and *cieux, œils* and *yeux, travails* and *travaux*, etc.; (3) the use of the article and different prepositions before masculine names of countries, such as, *aller en Danemark, en Portugal*; but *aller au Japon, au Brésil*.

Next Month:

POLYTECHNICS AT HOME AND ABROAD—

THE TECHNIKUM AT WINTERTHUR.



Carved Photo Frame, Swedish Design.

WE frequently hear our friends regretting the "good old times," when people and things were not as they are now. These friends, it may easily be guessed, are not teachers. For the teacher, the good old times meant cram and grind, according to hard-and-fast lines laid down by codes and inspectors, when each individual "pass" had to be scheduled and counted, and the gaining of the "excellent" merit grant was the highest ambition of the profession. Now we have the good new times, when the teacher classifies his pupils as he likes, teaches them what he will, and has no dread of the annual inspection, when the patient labours of a whole session were approved of or condemned by a comparative stranger.

Those nightmare times have gone, and now the cry is for a wider and more reasonable education; our children's heads and hands are to be used in a rational manner. We are to try to make their school life a time of real enjoyment and profit by showing them the beauties as well as teaching them the practical realities of their little world.

Art in the school and art in the home is at present receiving great attention, and teachers are beginning to realise that if they are to introduce arts and crafts to their pupils they must first be familiar with the subjects themselves. In schools—mostly Board schools, so far as our own experience goes; children who attend secondary schools are no doubt supposed to be sufficiently humanised and elevated by the refinements of art in the home—we now find nicely-framed copies of famous pictures adorning the walls, and statues filling up niches in the staircases and halls. In place of the inartistic and often hideous wall-sheets of former days, we see pictures of flowers, fruits, and animals in most artistic colourings. The class books are full of the daintiest illustrations. The tiniest tots are taught to paint natural objects in their natural colours, and to imitate in clay the everyday objects they see around them.

The educative effect of handwork is being recognised no less than the educative effect of art, even when that handwork is directed to practical objects of utility rather than of beauty. When a boy reaches the age of seven or eight, one of his most cherished possessions is sure to be a knife, and to have such a treasure and not put it to some use would be sinful. So the wise old folks about him have come to the conclusion that the best thing they can do is to teach him when and how to use it. This led to the formation of Sloyd classes, and the training of teachers to conduct these.

The famous Sloyd Training School at Nääs in Sweden is now well known, at least by report, to every reader of this journal. Those who have attended summer courses there will no doubt know personally the subject of this short sketch, Fröken Jenny Andréen of Gottenburg, who has been for some time one of the most successful teachers in the Nääs college. Besides her native language and the kindred Norse, she speaks English, French, and German, and for this reason the foreigners who attend the summer course are usually put under her care. She has had many pupils from our own country, America, and Holland, and not a few from Germany, Russia, Roumania, and Bulgaria, but very few French students ever attend these classes.

Miss Andréen has great faith in a Sloyd training as a means for obtaining neat and careful handwork in any branch of art. The perfection of her own work—which is simply marvellous—she attributes to her early training in Sloyd. The illustrations on these pages represent specimens of chip carving and leather-embossing designed and executed by herself. They were chosen from among many others, not because of any special superiority in workmanship, but simply because of their suitability for reproduction in this article, and any one who cares to examine them closely will soon notice the accuracy and neatness of every cut and line. Those who have themselves tried work of a similar kind will be the first to appreciate the difficulties she has overcome. On seeing her carved work one is at first inclined to think that her tools must be of great variety and of some special make. That is not so, however, for they are of the simplest design and very few in number; in chip-carving, indeed, only three tools are ever used, and Miss Andréen confesses to doing most of her work with one, which is a very slightly modified form of the ordinary pocket-knife. Then one decides it must be the kind of wood that makes the difference, but that again is a fallacy. Finally, one is forced to the conclusion that it is careful and patient work alone that attains such good results, and this is the true explanation. Miss Andréen insists on quality, not quantity, and thus she raises her work to the level of a fine art and not a mere decoration. Her designs, too, are worthy of notice, the Swedish one which heads this article being specially fine; and she advises her students to practise drawing and design alongside of any other branch of art which they may study.

At her home in Gottenburg Miss Andréen conducts a School for Arts and Industries, and at this place many of the Nääs

Large Book Cover—Embossed Leather Work.

Portfolio Cover—Worked in Leather.

students continue their work to perfect themselves in Sloyd, or to learn the more ornamental branches. Of course, in a school of this kind the work can be arranged much more systematically than when only a few courses of lessons are given. Miss Andréen likes to catch her pupils young, and many of them begin at the age of five. An assistant conducts a sort of kindergarten, where for two years or so the little ones learn Sloyd and cardboard work. They attend for an hour and a half each day, and drill or some other simple occupation is introduced by way of variety. Then they are drafted on to the usual day schools, but may continue their manual occupations, if they prefer to do so, by attending the night classes in Miss Andréen's school.

These evening classes for boys and girls have been most successful. They are held twice a week for two hours, and the subjects are grouped for more systematic instruction. For instance, drawing, clay modelling, and relief carving form one group; while drawing, cardboard work, and bookbinding form another. Miss Andréen finds this latter group much appreciated by her pupils, and she encourages them to bind for themselves the class books they use in their day school. Her day classes are for young ladies over fifteen, and in these too she expects the same systematic study of the subjects.

She paid her first visit to England two years ago, when she assisted at a summer course conducted by Miss Maria Andréen at Weymouth, and there she taught relief-carving, leather-embossing, and bent-iron work.

At the request of the Sloyd Association of Scotland, Miss Andréen was induced to come to St. Andrews this autumn and conduct classes in her own special subjects at the summer course held there. Besides Sloyd carving (chip and relief) and leather-embossing, she professes repoussé work, bent-iron work, and china painting; and the curious fact is, she does all equally well. In a three weeks' course only a few of these branches could be attempted, and yet it was surprising how much some of the students accomplished in that short time.

Her success there was so marked that she has decided to spend the winter in this country, and has secured a studio in Albert Buildings, Edinburgh, where she intends to conduct classes for teachers and others for a few months. One great advantage to teachers wishing to make a special study of Sloyd is that Miss Andréen's tuition is recognised by the authorities at Nääs as qualifying for the full certificate, and models done under her superintendence here, and stamped by her, are accepted at Nääs as part of the course. Teachers who intend going to Sweden later on will find this much to their advantage.

She has lately been invited to open classes in South Wales, and before she returns to Sweden she hopes to be able to give a course of lessons at some central district in London. Many teachers wish to turn their manual dexterity to use in some form of decorative art, and under such an instructress they will find scope for their best aspirations, both as regards design and execution.

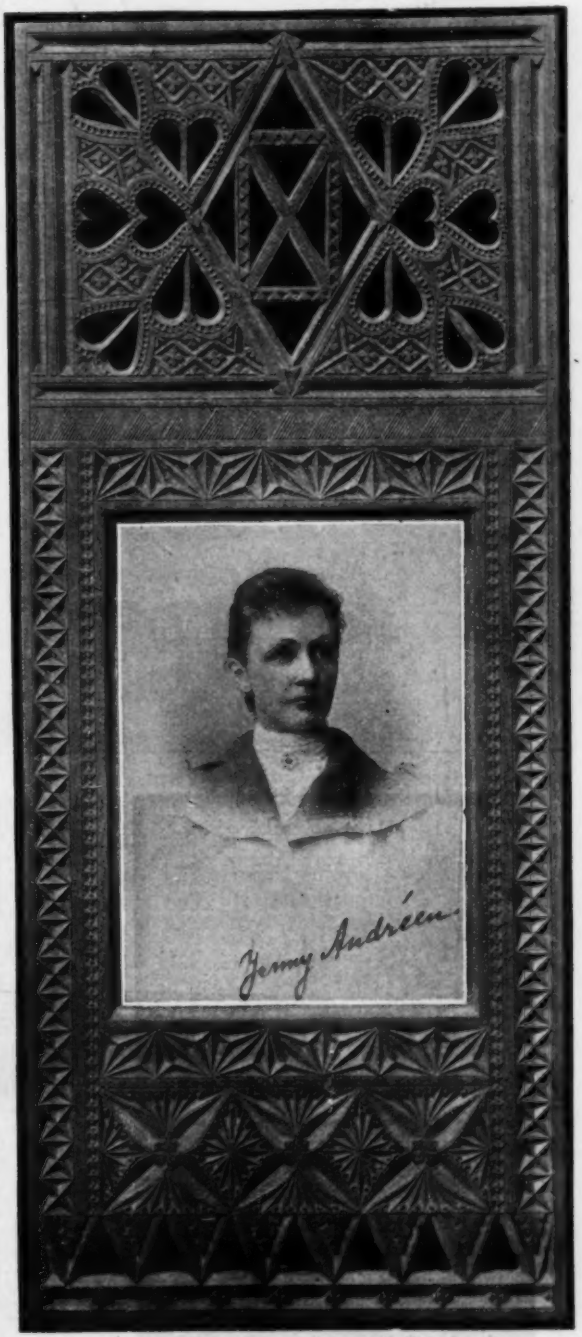
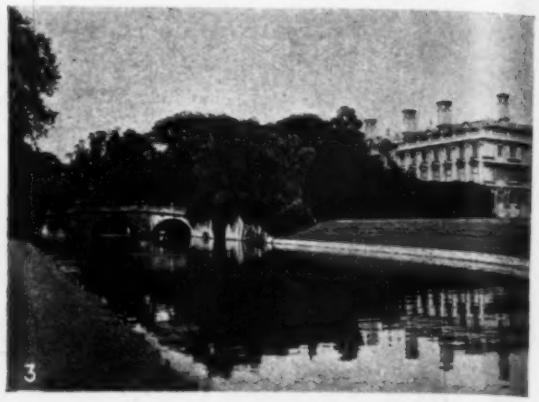
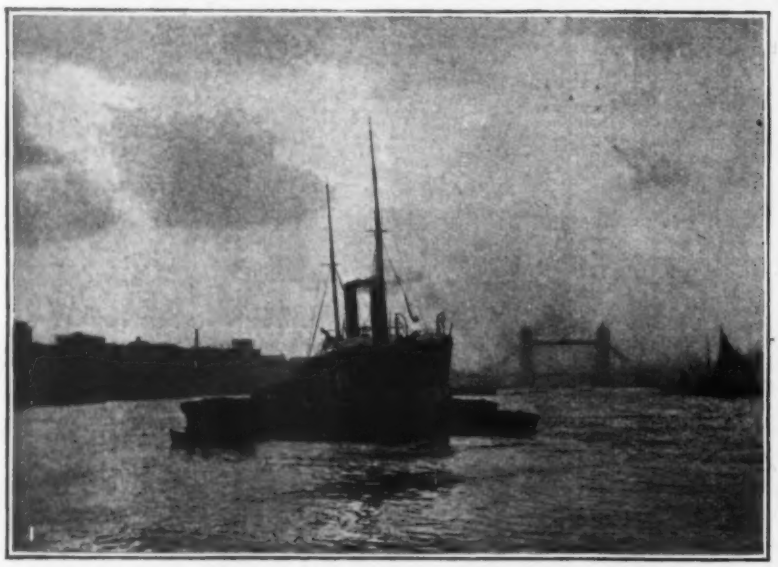


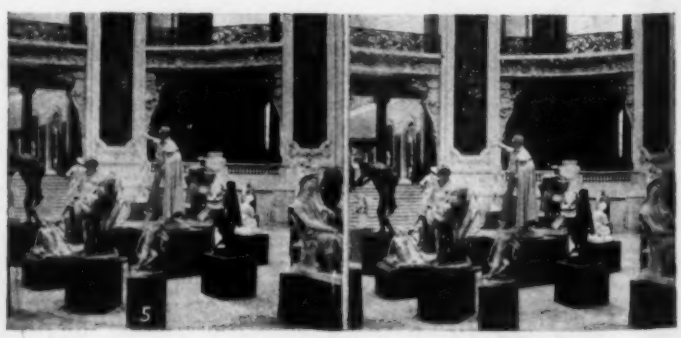
Photo Frame—Chip Carving.

OUR PHOTOGRAPHIC COMPETITION.

SELECTED REPRODUCTIONS.







1. The Coming of the Storm (*First Prize*)—F. G. Tryhorn.
2. Irish Cabins at Donabate (*Second Prize*)—Frank A. Pigott.
3. Clare College and Bridge, Cambridge (*Extra Prize*)—H. Ellwood.
4. "My Fairy" (*Extra Prize*)—Wm. F. Marwick.
5. Palais des Beaux-Arts, Paris Exposition: Interior (*Extra Prize—Stereoscopic Slide*)—W. J. Bassett-Louke.
6. Quietness (*Specially Commended*)—A. W. L. Dixon.

Our Monthly Retrospect

EDUCATION IN ENGLAND.

N.U.T. NOTES, ETC.

BY T. B. ELLERY, F.R.G.S.,

President of the National Union of Teachers, 1895–96.

The Teacher Members. THE forecast in these columns last month was, it will be admitted, an accurate one. Messrs. Gray and Yoxall have been returned for the second time for their respective constituencies, though one if not both had to fight against misrepresentation and abuse of an exceedingly virulent type. Then, too, in the case of West Nottingham, the Roman Catholic bishop issued a strong "whip" on behalf of the Unionist candidate for the city, and this undoubtedly accounted for the reduced majority of the teacher member.

All sorts of things were levelled at Mr. Gray. He was a spy in the service of the directors of the Great Eastern Railway, he was a paid agent of the Carlton Club, he was in receipt of a very large salary from the N.U.T., and so on. But Captain Gray faced the position with his usual manliness and courage: he placed the whole of the facts before the electors, and the result of the election showed what the people thought of the charges brought against their member. His majority of 2,480 is one of which he may well be proud.

Dr. Macnamara was fortunate in having an opponent so well known to the educational world in general, and the teachers of London in particular, as Mr. Diggle. In all probability, a worse choice, from the Unionist point of view, could not have been made. This being conceded, however, to wipe out an adverse majority of between six and seven hundred, and run up a majority on the right side (speaking, of course, from the teacher's point of view, and not politically) of over 1,300, is an achievement upon which the worthy doctor and the N.U.T., of which he is so distinguished a member, may be heartily congratulated.

Mr. Horobin (Stowmarket Division of Suffolk) could not, of course, hope to win. He was in the division but a very few days, and he had to attack a majority of over 1,400. In his case, better luck next time!

The Executive Jubilant. Probably the biggest red-letter day in which the Executive has yet taken part was Saturday, 6th October. The three teacher members were present, and were received with an enthusiasm hard to describe.

Mr. Marshall Jackman, the president, who did so much in Camberwell to secure the return of Dr. Macnamara, made one of his best speeches of congratulation; Mr. Blacker, the vice-president, followed; and Mr. Allen Croft (Nottingham) added a few very acceptable words. Every one was in exceedingly good form, the teacher members replying in the best of taste, and with a modesty which did credit to their heads and hearts alike. One can scarcely yet realise the immense effect of having three such men in the House as Messrs. Yoxall, Gray, and Macnamara, but one may be quite sure that the cause of education, and the interests of the children and the teachers, will be safe in their hands. Every member of the Union may well be proud of the remarkable success of the Union candidates at this election. There is important work to be done in the near future. The questions of Secondary Education and Reasonable Security of Tenure—with, let us hope, an amendment of the Superannuation Act—will come up for consideration in all probability before the new Parliament is a year old. The first two, at any rate, cannot be long postponed; and when they do present themselves for discussion, the right men are in the right place, and the House will have the benefit of the advice, experience, and knowledge of the men whom the Union and three constituencies have delighted to honour.

A Good Election Story. One of the Union candidates—do not ask for names—had an experience during his canvassing which is really worth a paragraph in these notes. He called upon an old fellow and asked for his vote and interest, presenting at the same time his election card. The only reply he received was an ominous shake of the head. Not to be beaten, however, the candidate said, "But let me put my views before you, sir, ere you decide to vote against me." Again the shake of the head. Still the candidate persisted, and placed point after point before the old fellow, only to be met at every stage with the same ominous movement of the head. Feeling at last that it was useless to attempt to persuade the voter, the candidate turned to leave, expressing the hope that if the much-desired vote could not be registered in his favour, it would not be given against him. Then for the first time the old man spoke. "I'm sorry, sir," said he, "you've taken all this trouble, but it's useless talking to me. I'm stone deaf!"

The Norfolk Confederation of Rural Teachers. Two or three years ago the writer of these notes suggested in these columns Great Yarmouth as the place of Conference in 1900 or 1901. He had just attended an excellent "combined meeting" in the town, and had been struck with the capital arrangements made by the local officers, who seemed in every way competent to undertake the more responsible duties of Conference workers. The suggestion was received with surprise in some quarters, and with amusement in others; but it has nevertheless been acted upon, and Yarmouth is now busily at work preparing for the "N.U.T. Week" at Easter next. On the 28th September last the Annual Conference of the Norfolk Confederation of Rural Teachers was held in the same town. It was well attended, teachers coming from all parts of the county, and exceedingly well managed. One could not fail to be struck with the capacity for business shown by those who had the arrangements in hand. The retiring president, Mr. J. Hulls; the new president, Mr. J. Lewton Brain; the treasurer (the veteran W. W. Pearson); the general secretary, Mr. F. B. Gale, and the active committee, all deserve the highest praise for the work they have accomplished in the past. One of the features of the Conference was the attendance of the newly-elected local member of Parliament, Sir John Colomb, and two other candidates, Messrs. Wilson (Mid-Norfolk) and Price (South Norfolk), all of whom delivered excellent addresses at the luncheon.

Miss Broome (Ipswich), member of the Executive, dealt ably with the tenure question, and made a very effective appeal on behalf of the Orphan and Benevolent Fund, the present writer following with an address on rural education. During the day the evils of "joint salaries" (man and wife often working for a salary too low for even *one* teacher), inadequate staff, unsatisfactory school buildings and teachers' residences, etc., etc., were all dealt with; and a resolution with respect to reasonable security of tenure was submitted to the public meeting in the afternoon, and carried unanimously. The Norfolk Confederation is doing excellent work, and deserves all the support and encouragement the Executive of the Union can possibly give.

Payment of the Superannuation Premiums. The Executive, at its meeting on 6th October, passed a resolution submitted by the chairman of the Superannuation Committee, laying down the principle that it would be unwise to ask School Boards and managers of Voluntary schools to pay the superannuation premiums of £3 and £2 a year.

It was felt there were grave objections to such a request

being made, one of them being that in many cases where these payments were made by managers, no really substantial increase of salary would be received by the teachers concerned. As a matter of fact, in every case these payments by managers must be made in the form of increase of salary, to satisfy the auditors at the close of the school year. That being so, any really satisfactory improvement in the matter of income would be out of the question, for many managers would reply, "We have already paid your superannuation premium, and that ought to be, and must be, sufficient." The Executive does not, of course, say teachers must refuse such an offer, if made; but it should be accepted only after very careful consideration, and after a discussion with the managers of the whole position.

Let us hope that in time—say after the first Government valuation—improved terms will be offered to existing teachers. The least that should be done for them is, that they should be placed upon the scale which applies to "future" teachers. It is idle to suggest an earlier age for retirement. New tables would be required, and unless the Government is prepared to make a much larger subsidy than it does at present, the cost would be thrown upon the teacher. The teacher members in the House and the Union's Superannuation Committee may safely be trusted to do all that is possible in this direction.

The Vice-Presidency of the Union. With the General Election a thing of the past, teachers will soon begin to think of the contest for the vice-presidency of the Union. Already several candidates are in the field, including Mr. Allen Croft, Mr. H. Coward, and Dr. Beach, and doubtless others have been, or shortly will be, nominated by the local associations. To the surprise of many, Mr. T. H. Jones, nominated by Finsbury, has retired from the contest; but those of us who know all the circumstances are aware that he wishes to give all his time for the present to the tenure work of the Union, in connection with which there should be some important developments before the next Easter Conference. His work as chairman of the Tenure Committee will be a strong recommendation when he enters himself for the chair of the Union. Mr. Allen Croft has proved himself an able lieutenant to Mr. Robert Wild on the Education Committee, and he is an effective speaker and hard worker. Mr. Coward has rendered good service as vice-chairman of the Superannuation Committee, and Dr. Beach as chairman of the Law Committee. On the last occasion, Mr. F. Peaker, the chairman of the Finance Committee, and Mr. T. John, who has done most useful work on the Parliamentary and Organisation Committees, and in other directions, were candidates for the post, and we shall probably hear of them again in that capacity; and there may, of course, be others. So far, Dr. Beach is the "new man," and it may be taken for granted that he will be strongly supported, as, indeed, he deserves to be. The contest promises to be even more than usually interesting.

The N.U.T. Lending Library. Another new departure has been made, and we may safely say that it will meet with the approval of the great majority of the members of the Union. The original idea was to cater chiefly for teachers in the rural districts who could not easily attach themselves to existing libraries; but as the arrangements proceeded, it was felt that those working in urban schools might also be allowed to avail themselves of the privileges offered, if they cared to do so.

With proper management, there ought to be a successful future for the Union's lending library.

"The Outlook" on the Dual System. In referring to the recent Church Congress and the subjects debated at that gathering, *The Outlook* says:—"In the evening there was an excellent speech from the Vicar of Leeds, but not a few friends of educational reform will wish that the Archbishop of Canterbury had kept silence on this occasion. It is an open secret that upon this matter he is at variance not only with every educationist, but with almost all the other bishops. No one, except Dr. Temple, believes that the present dual system of Voluntary and Board schools should be—or, indeed, can be—retained. A number of schemes for replacing it have been put forward, of which the Bishop of Coventry's and the Provost of Denstone's seem the most feasible. Where else can the question be properly threshed out, if not at the Church Congress, so that churchmen may come to Parliament resolved on a common policy?

"The fact is, that in this matter of elementary education a reasonable *modus vivendi* can be reached, and is sometimes reached, by all Protestant denominations of the Christian church where there is good will on both sides; and the bitterness of the controversy on the conscience clause has been due to the extreme bigotry of a few champions on each side—honest men, no doubt, but lacking practical wisdom. A "round table" conference of Christian sects would probably do much to clear the air; only it must be borne in mind that each side must concede something."

One can only add that if this great question were approached in some such spirit as this, a solution satisfactory to everybody, save the extremists on each side, might be found.

M.P.'s and the Tenure Question. The local Parliamentary correspondents of the Union have been doing excellent work during the General Election. Candidates have been interviewed all over the country on the question of reasonable security of tenure for teachers, and with very satisfactory results. It may, of course, be necessary later on to remind certain gentlemen of their pledges, but from the results to hand there can be only one conclusion—the House of Commons is committed to some measure or other which will, in the words of Sir Henry Campbell-Bannerman, who was recently interviewed on this question by a deputation from the Educational Institute of Scotland, "*save the community from scandal, and the teachers from hardship.*" In this matter, at least, Sir Henry can work in complete harmony with the Government, if only the Cabinet can be induced to introduce this long-deferred measure of justice and fair-play to teachers.

EDUCATION IN SCOTLAND.

E.I.S. NOTES, ETC.

BY JAMES PATERSON,

Ex-Vice-President of the Educational Institute of Scotland.

Sir Henry Craik on Literature. In the course of an address on "The Production of Literature," delivered at Nairn recently, Sir Henry Craik said they might produce a reading public, but he was afraid that had little to do with the production of literature. What they desired to do in their schools was to make pupils a little less bookish, and to teach boys and girls to think for themselves, and, still more, to act for themselves. Instead of that being the worst preparation for literature, he thought it was a better introduction to the subject than the merely bookish work to which they so closely devoted themselves. Real literature consisted in quality, not quantity. Speaking of poetry, Sir Henry considered it the very highest example of literature.

Women Teachers' Meetings. On the afternoon of the annual meeting day of the E.I.S. two separate meetings of women teachers were held in Edinburgh, under the auspices of the ladies of the east and the west respectively. Various educational questions of a practical nature were discussed, some of which are referred to below.

Sewing in Schools. Mrs. Kerr, a member of the Edinburgh School Board, and the convener of its Domestic Economy Committee, read a paper on "Sewing." Mrs. Kerr favoured, as far as was possible, children taking garments to school to be mended. While she was decidedly of opinion that utility should be the first requirement, she would like to see the beautiful become its handmaid. Miss Fish, Glasgow, dealt with the same subject, more especially with reference to pupil teachers, and criticised the requirements of the Code as to cutting-out. In Miss Fish's opinion, garment-making should be abolished in the training colleges. The time so spent, she thought, could be more profitably given to further training in the best methods of teaching sewing, and to the pursuit of higher branches of study.

Training of Women Teachers. Miss Hamilton, L.L.A., of the Glasgow Pupil Teachers' Institute, spoke on "The

Training of Women Teachers." While the Government declared all candidates who passed certain examinations eligible to receive professional training in the normal colleges, there was no accommodation in these institutions for a very large proportion of those qualified. The consequence was that, in spite of the need for trained teachers in the public schools, many suitable candidates were obliged to join the ranks of untrained teachers. This was not as it ought to be, and she called upon the Institute branches to support the demand for increased training college accommodation.

Work in Country Schools. Miss M'Kell, Beith, delivered an address on "Work in Country Schools." The mistress in a country school, she said, had special difficulties to encounter. In regard to needlework, she thought the youngest scholars should be free from this task, and in rural schools needlework should be the only form of manual instruction for girls. In the discussion which followed, the suggestion was made that a special curriculum might be drawn up for schools in which there was only one teacher.

School Staff. Miss Thomson, Glasgow, followed with a paper on "School Staff." It was in the infant and junior departments that the minimum staff was most frequently found. There one would often see too many pupil teachers and too few experienced teachers. Some people seemed to think that the difficulty of teaching a child was in proportion to the space it occupied. It was so—in inverse ratio. The Glasgow Branch, she reminded her hearers, had in December last passed a motion unanimously declaring that pupil teachers should not be reckoned as part of the school staff.

Resolutions. Resolutions on the lines of the various discussions were adopted, calling upon the General Committee of the Educational Institute to consider the questions and to take action in regard to them.

Duke of Argyll on Technical Education. In a speech at the opening of the Paisley Technical School, the Duke of Argyll pointed out that English companies were now in some measure supplanted by Germans on the continent of Europe. In the Far East and other places it was the same, and our American cousins were also treading very hard upon our heels. There was a danger of depending too much on the opinion of experts without examining things for themselves, and without comparing our way of carrying on an industry with that followed in other lands. In this connection, his Grace advocated that in such institutions travelling scholarships should be inaugurated.

Presentation to Mr. Jerome Wallace, F.E.I.S. Mr. Jerome Wallace, F.E.I.S., formerly of Canonbie, who was recently appointed Director of Manual Training in Canada, seems to be winning golden opinions in the country of his adoption. Mr. Wallace has had charge for a short time of the Macdonald Sloyd system of manual training in Brockville, and on the occasion of his leaving for another district, he has been presented with a gold-headed cane by a number of the members of the Public and High School Boards, as a mark of their appreciation of his services, and of their good wishes for his future welfare and success.

Interviewing Parliamentary Candidates. The Parliamentary Committees of the various local associations of the E.I.S. have had a busy time lately interviewing the numerous candidates for parliamentary honours on the subjects of tenure of office and an improved superannuation scheme. It is gratifying to learn that the reports from all parts of the country are satisfactory. On the question of tenure the candidates are practically unanimous that some court of appeal must be granted. Some favour the extension of School Board areas, while others regard the Department as the natural authority to decide in cases of dispute. It was made abundantly clear by members of the deputations that Clause 13 of Lord Balfour's Bill of last session would not have been considered by teachers a satisfactory solution of the difficulty.

Every Reader of the "Practical Teacher" should see the
PRACTICAL TEACHER'S ART MONTHLY.
PRICE TWOPENCE.
(*See Advertisement at end of Paper for List of Contents.*)

NOTES FROM THE NORTH.

The September Meetings. PECULIARLY fortunate with regard to the weather as the September meetings usually are, perhaps at no time were they more favoured than on the occasion of the fifty-fourth annual general meeting of the Educational Institute of Scotland. This, no doubt, to a great extent accounted for the very large gathering of delegates and others that completely filled the large hall and overflowed into the quadrangle of the Royal High School. Last year we referred to the increasing interest in the doings of the Institute, and consequent overcrowding of the hall, and called attention to the pressing need for a larger place of meeting. But, even individually, teachers are particularly conservative; and collectively, in the E.I.S., they are even more so. Those who were present on Saturday, 15th September, will bear us out in saying that the time has now come for some action in the matter. We are within the mark when we say that over two hundred were forced to stand the whole time of the delivery of the presidential address, and many more did not even get a look inside. The question of accommodation for the publishers' exhibits—increasing, too, in number, interest, and value—is looked upon by many as an insuperable difficulty; but surely in Edinburgh a larger hall, combining both requisites, might easily be found. *A propos* of this subject, and closely related to it, is the question of the Institute's securing for itself in Edinburgh "a local habitation and a name"—a place in which the meetings of the various committees might be held, where an educational bureau and library might be established, and where country teachers might meet.

The Burgh and Parochial Schoolmasters. Taking advantage of the goodly gathering of the brethren, various associations held their annual meetings on the Friday preceding "the first Saturday after the third Friday in September," to borrow the circumlocutory, though perfectly definite, phraseology of the charter. The "Burgh and Parochials," the Old Guard of the profession, were the first to meet. There was a good muster, though year by year, and this year perhaps more than any preceding, sees their ranks gradually thinning. On account of illness and family bereavement, the president (Mr. Henderson, Cockburnspath) was absent, and there was no presidential address.

The secretaries reported that, as a result of a special census in view of the close of the century, there were still 136 O.P.'s still in active service, though this number was likely soon to be diminished in view of many early retirals. Slightly over 200 were enjoying their pensions, so that 450 represented the number of Old Parochials, all told.

The treasurer stated that the following allowances had been granted during the past year—namely, three at £150, one at £133, 6s. 8d., one at £126, 13s. 4d., one at £116, 6s. 8d., two at £100, one at £95, two at £75, one at £71, 6s. 8d., three at £65, and one at £60. The average of these is close on £100, and it would have been an interesting comparison had the pensions they would have received under the present Superannuation Act been mentioned.

The Schoolmasters' Widows' Fund. Immediately after the O.P.'s meeting, the trustees of the Widows' Fund—for the most part the same members—held their annual meeting. Mr. Doak, Neilston, the giant of the profession, in his retiring address, compared the fund as it now stood with its position at the passing of the Education (Scotland) Act of 1872, and pointed out that the number of contributors had decreased from 1,280 to 414, and that the number of widows had increased from 293 to 298.

The cashier reported that £5,737, 17s. 6d. had been paid to 317 annuitants. There were still 383 contributors, and the fund stood at £102,104, 3s.

Who can say that the old race of teachers were thriftless?

The Scottish Teachers of Agriculture. This association held its annual meeting in the University. Mr. T. Dick, Kirknewton, the retiring president, in the course of his remarks, referred to the success of the classes held during the winter, in drawing and nature-knowledge. He said that the association, in undertaking such classes, was only endeavouring to carry out the special object for which it had

been established. He regretted that through lack of funds these classes would have to be discontinued. But it seems to us that this work should rather be undertaken by the E.I.S., and that Circular 294 opens up to that body an almost unoccupied field of usefulness. The examination body of the Institute should at once consider the question. We hope to see such work undertaken by the E.I.S. This would be in the line of Dr. Gunn's recent paper.

The Currie Club. The Currie Club in connection with the Edinburgh Church of Scotland Training College held its annual meeting in the evening. There was a good attendance. Mr. Scott Stevenson, Stirling, in the course of his closing address, referred to the improved conditions in salary, security of tenure and service, which have been secured during the past twenty years. It was but natural, too, that he should refer to the subject so much on the *tapis* at the present time—namely, more direct representation of teachers on educational committees. In justice he thought some change was necessary.

The Moray House Club. The sister club held its twenty-fourth meeting on the same evening. There was a large gathering of members and friends. The membership showed a gratifying increase of 41, making a total membership of 1,278. The Library and Benevolent Fund in connection with the club were reported as having during the year done valuable work. Mr. Anderson, Dumbarton, in his remarks, dealt mainly with the great hindrances to the teacher's work met with in the manners and morals of the children of the present day. He dwelt specially on two evils—cigarette smoking and the use of profane language. He argued that if improvement was to be effected, the parents should do more, both by precept and by example, to help to remedy the evils.

Meeting of Fellows. The annual meeting of the Institute is usually preceded by the gathering of "fellows," who sit as judges on the recommendations for the "new fellows." There was very little cause for objection in the present year's list, but there is a growing feeling, among both members and fellows, that the list should be considerably curtailed. It is the opinion of many, well qualified to judge, that the honour is being bestowed too lavishly. If the degree is to be of value, the recipients should be, like "Cæsar's wife," above suspicion.

President's Address. Before the "fellows" had time to reach the hall, the place was packed with delegates and members; so that when the president (Mr. W. Blackstock, Kirkcaldy), accompanied by the circumtabular oligarchy of officials and former presidents, entered, there was not even standing room to be had.

Some informal business over, the president was called upon to deliver his retiring address. The recent severe illness of the president had told its tale in his "attenuated figure," to use his own expression. As we hinted in our last month's notes, he took as the main subject of his paper the recent educational legislation. He thought the Bill of last session was an honest attempt to meet the various conflicting interests which rendered this question so difficult of solution. Questions of control, of finance, of political principle, and of administration, were raised by it, on all of which, in more or less degree, differences of opinion had been found to exist. Permanence on this question could only be secured by the adoption of one of two methods—either that the secondary education of Scotland should be carried out on the lines of the Welsh Intermediate Act, in which case the Government would require to provide the necessary funds, or secondary education should be carried out by a body elected solely for educational purposes—one Board for all classes and kinds of schools.

The adoption of enlarged School Board areas would meet most of the objections to the late Bill. It would secure to teachers a better chance of promotion, as well as fair treatment; would remove much of the overlapping, if not all, that existed in connection with higher education; but, best of all, would secure a body elected solely for educational purposes, able to view education from its lowest to its highest grades, and to understand its needs, and the close inter-relation that existed between public schools and higher education.

He held that it would be a benefit to the teacher to be placed under direct Government appointment and control—to become, in fact, a portion of the Civil Service. We noted here that this position was not too well received by the audience.

The provisions of the Bill with regard to regular attendance commanded, he thought, universal approval. To the phrase "individual children over twelve years of age" should be added the words "who have obtained the merit certificate."

This certificate—the goal of the elementary school—should be the measure of general ability, and no child should be deprived of it because of an inspector's over-appreciation of some point of school detail.

Progress has been made during the past eighteen months. The welfare of the educator was identical, he maintained, with the highest educational development. It was receiving more and more of public attention and parliamentary regard. We entered the new century, therefore, high in hope as regards both forms of public education, and proud of our profession, which fitted, trained, and enabled us to work for the material welfare and highest interests of Scotland.

With an appreciative reference to the worth of Major Mackenzie, whose loss was so tragic as not to require any elaborated expression of sorrow, he concluded his able and valuable address.

Election of Officials. Mr. Menzies, J.P., Kirriemuir, was proposed from the chair as the new president. The nomination was seconded by Mr. G. Rae, the next of the unsuccessful candidates for the presidentship. This graceful act will stand much in Mr. Rae's favour in the coming election. With the thanks of the meeting to Mr. Blackstock, and the election of Mr. G. Lowson, M.A., B.Sc., Stirling, to the vice-presidentship, the more formal business was at an end.

Mr. J. Laurence and Dr. A. Mackay were re-elected secretary and treasurer respectively, and Dr. Dickie secretary to the Board of Examiners.

Membership. It was reported that 457 new members had been added to the Institute during the past year, so that the membership now stood at 6,190. There is still a goodly number outside the fold, for the number of elementary teachers is over 10,000. Some effort will therefore require to be made by the Organisation Committee of the Institute to secure a greater addition during the incoming year.

The reception of fellows was then proceeded with, and as this year there were three honorary fellows admitted (Sir Colin G. Macrae, Edinburgh; Dr. Andrew Henderson, Paisley; and Lieutenant-Colonel Cruden, Aberdeen—all of them distinguished workers in the cause of education), the forenoon meeting was a little extended in order to hear the first two return thanks.

Afternoon Sederunt. The afternoon sederunt is usually attended by a limited number, but this year proved to be a very agreeable exception, for on the resumption of business the hall was again well filled. This was due to the discussion on Superannuation. The lady teachers of the Institute seemed to be divided in opinion as to whether they should be allowed the option of retiring at fifty-five. As a result, the first part of the business was practically given up to taking the opinion of the meeting on this question. There was a considerable majority in favour of fifty-five. To our mind, the question is hardly within the range of practical politics, and, especially in view of the enormous war bill, it looks as if very little would be done to remedy the Superannuation Act in any point.

The rest of the business was merely routine, though it afforded no end of talk and entanglement, largely due to the "loose rein" given to many by the president. This part of the meeting raised, in our mind, the very important consideration of whether it would not be better for the retiring president, who has had a year's experience in the conducting and guiding of committee work, and who is also likely to "know the ropes" better, to continue in the chair till the end of the meeting, and give his retiring address at the end rather than at the beginning.

On the whole, the Institute is to be congratulated on its past year's efforts. There remains much, very much, still to be done with regard to increased membership. The truth of the president's remark that one works where nine criticise is only too true with regard to the Institute, like many kindred

associations. The Institute's power during the past year has not diminished, and that the opening year of the century will see increased power and greater progress through a largely augmented membership is only a reasonable hope.

FOREIGN NOTES.

BY E. E. FOURNIER D'ALBE, B.SC., A.R.C.S.

THE newly-planned commercial college for Bâle will be quite up to date, if all the provisions of the prospectus are carried out. Among the less usual departments we may mention technical chemistry, insurance, social and political economy, financial science and practice, railway practice, posts and telegraphs, customs, navigation, nautical and commercial law, law of patents and trade-marks, and the psychology and methodology of commerce. There is, of course, to be full instruction in modern commercial languages, including German, French, English, Italian, Spanish, and Russian; but Chinese—the language of one-third of mankind—does not seem to be contemplated as yet. Journalism is represented by a special department, and the popular idea that "a journalist is born, not made" is to be directly challenged. Public health and the prevention of accidents are to be dealt with by a special professor. Nothing that can possibly affect the commercial success of a nation is to be left out of account; and if colleges can effect such a change as is expected of them, the Swiss will ere long be converted from a nation of hotel-keepers into a nation of shop-keepers. Women are to be admitted on equal terms with men. In this respect Switzerland has long been a model to the rest of Europe.

* * * * * *

M. Jean Tinot, in the *Revue des Revues*, has something to say in answer to the article which appeared in *The Journal of Education* concerning the spread of the English language and the decay of the French. He admits that French has lost its prospects, so confidently entertained from the fifteenth to the middle of the eighteenth century, of becoming the language of the world. At the beginning of the nineteenth century the European languages stood thus: French and Russian equal, German, Spanish, English, Italian. Now they stand: English, 110 million speakers; Russian, 85 million; German, 80 million; French, 58 million. The spread of English is largely due to the facility with which the United States have converted immigrants from all the world into English speakers, and the majority of English speakers are at present outside the British Empire. M. Tinot proudly claims that "French is the language of all who thought, from Charlemagne to Bonaparte—a good long reign," and says that if French is to die, it will give lessons to its successors from its tomb. But M. Tinot need not fear. French will not die. Languages do not die nowadays if they have a literature. Languages are, in fact, reviving all around us. The final solution of the language problem will be that every one will speak two languages—his own and the world language, be the name English, Russian, or Chinese.

* * * * * *

In the *Journal des Instituteurs*, Mme. Leyx has a vigorous article against the prevalence of superfluous personal adornment, especially in young girls. With us, the practice of wearing earrings is fortunately almost extinct; but in France, especially in the more southern regions, it still largely prevails, and it is nothing uncommon to see a little girl's ears badly inflamed by wearing gilt earrings made of copper. In the South Sea Islands, also, men and women adorn themselves with pieces of metal inserted in their ears and noses and lips, and have their skins tattooed with lively colours. But it is full time that such practices should cease in countries boasting of their civilisation. "The use of jewels undoubtedly destroys any plastic beauty," says Mme. Leyx, "and can only increase any ugliness by, so to speak, bringing it into relief." There is, however, no objection to women and girls dressing their hair properly, as that is their greatest natural adornment. But any foreign and extraneous ornament should be carefully avoided. Mme. Leyx attributes a great deal of the penury of the average French household to a want of balance in the domestic economics, too much expenditure being incurred for external appearances. A reform in this direction should not be difficult for good French common sense.

* * * * * *

In German East Africa the German language is, of course, taught in all the government schools; and as those schools are much frequented, and, on the whole, excellently conducted, German will no doubt, in course of time, trickle through the vast territories to the east of Lake Tanganyika. But the attempts to impart a correct German accent to the little nigger boys end sometimes in a somewhat ludicrous failure. Thus, when on a recent occasion the governor was greeted at Dar-es-Salaam with the German National Anthem, sung by the school children, he was quite at a loss to make out what language they were singing it in. He heard distinctly "Hascha desim Fatalam," and was told it stood for "Herrscher des Vaterlands." He has since encouraged the translation of German songs into Swahili, thereby imitating the custom of the English missionary societies, whose whole curriculum is practised in the vernacular. And so the negro children, who are immensely fond of music, go about singing "Der Mai ist gekommen" in their mother tongue; and though the beauties and seasons of nature in the tropics are somewhat different from what they are in the Vaterland, we may hope that the melody and the translated words convey to them some sense of kinship with the mother country given to them by international agreement.

* * * * * *

The Greek Government has brought in a Bill for the reform of the secondary schools in Greece. Up to the present, the Greek curriculum comprised a course of three years in the Demotic School, three years in the Hellenic School, and the option of a further four years in the Gymnasion. The Demotic School course is now to be extended to four years. The Hellenic School and the Gymnasion are to be abolished, and replaced by the Lykeion. The latter will have two different types—one classical, and the other modern. The classical Lykeion gives Latin and more old Greek, history, and philosophy; while the modern Lykeion teaches more French, mathematics, and science, and adds German or English. What is surprising is that even in the modern Lykeion old Greek is taught during sixty-five hours per term, and modern Greek only during six. It shows what supreme importance is attached to the ancient literature, and is, on the whole, distinctly pleasing to note. Gymnastics are indulged in for twenty-four hours per term, and any surprise that may be felt at the equality between science and gymnastics in this respect will be increased by the fact that gymnastics are compulsory, and a failure to pass the prescribed examination is enough to stop promotion to a higher class. The Lykeion has an eight years' course, and many excellent reforms are contemplated in the hope of making the schools independent of political changes.

* * * * * *

In a recent number of the *Boletín de Enseñanza Primaria*, José Figueira pleads for a system of cyclical evolution (*desenvolvimiento ciclico*) in the teaching of history in elementary schools. He complains that in the present system, in Uruguay at all events, there is a lack of continuity between the teaching of home history in the first three classes and general history in the higher classes. What he demands is that a summary of the main features of the whole should be given in the lowest class, and that the skeleton thus formed should be filled in more and more with each succeeding stage. This system has been advocated for some time in France, where it is known as the concentric system; but there it is made to cover the whole of the ground, as is seen in the excellent *École Moderne* series of class-books. Whether a system which has hardly been accepted in France will be first adopted in Monte Video remains a question. But stranger things have happened. The progressive spirit shown in some of the South American states in educational matters is very encouraging. Chile and Uruguay are the most notable examples. Their history practically consists of three chapters—Spanish conquest, colonisation, and independence; and though their governments have not the stability of those of older countries, their material progress rivals that of Mexico, which is saying a great deal.

OUR CLASS-ROOM AIDS.

OUR EMPIRE SUPPLEMENTS.

2. BRITISH IMPORTS AND EXPORTS.

(See Supplement presented with this Number.)

WE are often taunted by our Gallic neighbours, when they grow tired of calling us perfidious, with being a nation of shopkeepers. Well, there is no denying the fact. Our "shops" range from the humble one with a stock-in-trade worth half a crown to the gigantic works which employ thousands of hands and can turn out a completely fitted, first-class ironclad. We do more trade than any other country, we earn more money, and there is just a suspicion of envy in the charge levelled against us. We are blessed with extensive iron-fields and coal-fields, with a healthy and invigorating, though perhaps fickle, climate, and, above all, with a population of *workers*. "An English navvy," says Emerson, "can do as much work in a day as three Frenchmen."

Let us look at our annual balance. The most recent figures (1898) stand:—

Imports from foreign countries	£370,944,628
,, from British possessions.....	99,433,955
Total value	£470,378,583
Exports to foreign countries.....	£203,903,252
,, to British possessions	90,110,736
Total value	£294,013,988

At first sight it would appear that we were £176,000,000 to the bad, with the prospect, as Mr. Micawber would put it, of "mesery" staring us in the face. But it must be remembered that these figures represent only the value of *goods*. In addition to this, there is a continual stream of *money* flowing into the country—the interest on British capital invested abroad, and the payments made for carrying goods in our mercantile marine for other countries. This more than makes up the deficit.

If we look more closely into accounts, we find that the largest bills we pay are for (1) food and drink, and (2) raw materials for our manufactures. England does not produce enough food to support its population many weeks; and if communication with other countries were cut off, famine would soon make its appearance.

The following, in tabulated form, are the chief articles of food we have to buy, their values, and the places from which they come:—

FOOD AND DRINK SUPPLY.

ARTICLE.	ANNUAL VALUE.	COUNTRIES FROM WHICH SUPPLIED.
Wheat.	£26,000,000.	United States, Russia, British East Indies, Canada.
Other cereals (barley, oats, rye, pease, and beans).	12,500,000.	United States, Russia, British East Indies, Canada.
Wheaten flour.	11,000,000.	United States and Canada.
Butter and margarine.	18,000,000.	Denmark, Holland, Canada, Australia.
Cheese.	5,000,000.	United States, Holland, Canada, Belgium, Switzerland, France.
Eggs.	4,500,000.	France, Germany, Russia, Belgium, and Denmark. (We consume annually over 2,000,000,000 eggs.)
Lard.	3,500,000.	United States and Canada.
Bacon and hams.	14,000,000.	United States (79 per cent.), Denmark (20 per cent.), Canada.
Beef (fresh).	6,000,000.	United States, Australia, and New Zealand.
Mutton (fresh).	5,000,000.	Argentine Republic, Holland, Australia, and New Zealand.
Pork (fresh).	1,250,000.	Holland and the United States.
Other meat (salted and preserved).	£3,500,000.	United States, Australia, and New Zealand.
Live oxen.	9,250,000.	United States and Canada.
Live sheep and lambs.	1,000,000.	United States, Argentine Republic, Canada.
Fish.	3,500,000.	Norway and Sweden, United States, France, Holland, Denmark, Canada.
Poultry and game.	630,000.	Various countries on Continent.
Rabbits (dead).	560,000.	Ostend and Australia.
Condensed milk.	1,500,000.	Switzerland and Norway.
Apples.	1,200,000.	United States and Canada.
Onions.	800,000.	Spain, Holland, Egypt.
Potatoes.	1,900,000.	France, Germany, Belgium, Holland, Channel Islands.
Oranges.	2,000,000.	Spain and Southern Europe.
Rice.	2,000,000.	India, Italy, China.
Sugar.	17,000,000.	West India, British Guiana. Beet sugar (all countries of Central Europe).

Science has been called in to assist in the transportation of perishable goods, which are either brought to us in ships fitted with refrigerating chambers, or else canned or bottled. By these means we enjoy lemons, grapes, pine-apples, apricots, and pears from subtropical countries; while a great trade in dried fruits is carried on with the Mediterranean seaports.

We also need many flavourings and spices to increase the attractions of our food—cinnamon (*Ceylon*), ginger (*East* and *West Indies*), allspice (*Jamaica*), vanilla (*India* and *Mexico*), cloves (*Zanzibar*).

ARTICLE.	ANNUAL VALUE.	COUNTRIES FROM WHICH SUPPLIED.
Beverages.		
Tea.	£10,000,000.	China, India, Ceylon, Natal, Java.
Coffee.	3,500,000.	West Indies, India, Ceylon, Brazil, Java.
Cocoa.	2,000,000.	Central and South America (Venezuela, Brazil, Ecuador, etc.).
Wines.	6,500,000.	France (*claret* and *Burgundies* and *champagne*), Portugal (*port*), Spain (*sherry*), Germany (*Rhine wines*), Austria, Italy.
Spirits.	1,100,000.	France (*brandy*), West Indies (*rum*), Holland (*Curaçoa*).

We also spend £1,000,000 on drugs, £2,000,000 for gloves, £1,250,000 for musical instruments, £16,000,000 for silk goods, £3,800,000 on tobacco, £1,100,000 for toys (mainly from the Continent), £1,000,000 on watches, £500,000 on French and German clocks, £1,400,000 on feathers, and £3,000,000 on glass.

RAW MATERIALS FOR MANUFACTURE.

ARTICLE.	ANNUAL VALUE.	COUNTRIES FROM WHICH SUPPLIED.
Wool.	£24,000,000.	Australia, New Zealand, Argentina, South Africa.
Flax.	3,000,000.	Russia, Belgium, Holland, Italy, France.
Cotton.	34,000,000.	United States, Egypt, Queensland, India, Brazil.
Silk.	1,300,000.	China, Japan, France, India.
Jute.	5,400,000.	India.
Hemp and tow.	2,300,000.	Russia, Germany, Italy, Manilla, New Zealand.
Hides.	3,000,000.	Baltic ports, Argentina, Canada, Australia.
Wood.	23,000,000.	Norway and Sweden, Canada, India and Burmah (*teak*), Brazil (*rosewood*), Honduras (*mahogany*), Ceylon (*ebony* and *satinwood*), North America (*maple*).
Copper.	6,700,000.	Russia, Canada, Cape Colony, United States, Chili, Australia.
Iron ore.	4,000,000.	Spain (*red hæmatite*), Sweden (*black magnetic*).
Lead.	2,500,000.	Spain, Australia, United States.
Silver ore.	1,145,000.	Andes, Mexico, Montana, Nevada, Australia.
Tin.	1,400,000.	Malay Peninsula.
Zinc.	2,000,000.	Belgium, Germany, United States.
Petroleum.	3,700,000.	Russia (Baku), United States (Pennsylvania).
Precious stones.		*Diamonds* from Kimberley and Brazil, *rubies* and *sapphires* from Ceylon and Burmah, *pearls* from Ceylon and Persian Gulf.

EXPORTS.

ARTICLE.	VALUE.	COUNTRY TO WHICH EXPORTED.
Coal.	£18,000,000.	Scandinavia, Holland, Belgium, Spain, Portugal, Italy, and to all coaling stations.
Iron and steel (raw material).	7,000,000.	These articles are not exported to any particular countries, but find a market all over the world. Our colonies are very good customers of the mother country; and all other countries where manufactures are in their infancy, or do not exist at all, find it cheaper to buy from us.
Railway plant.	1,800,000.	
Hardware and cutlery.	1,988,000.	
Implements and tools.	1,300,000.	
Steam engines.	3,626,000.	
Machinery.	14,763,511.	
Other iron and steel goods.	15,600,000.	
Other metal goods (copper, etc.).	5,000,000.	
Arms and ammunition.	2,500,000.	
Cycles.	1,000,000.	
Cotton goods.	65,000,000.	West Indies, South America, Central Africa, India, China, Japan, East Indies.
Woollen goods.	20,000,000.	France, Belgium, Germany, United States, Canada, and all countries in the temperate zones.
Linen goods.	5,200,000.	United States, Germany, France, and the Colonies.

In addition to these, we dispose of apparel, £4,600,000; beers and ale, £1,600,000; books, £1,300,000; rubber goods, £1,300,000; chemicals, £2,500,000; earthenware and china, £1,800,000; herrings and other fish, £2,500,000; hats, £1,000,000; leather and leather goods, £3,200,000; manures, £2,000,000; spirits, £2,000,000; painters' colours and materials, £1,689,000; medicines and drugs, £1,000,000; pickles, vinegar, and confectionery, £1,300,000; paper and stationery, £1,500,000.

BLACKBOARD DRAWING.

FLOWERS.

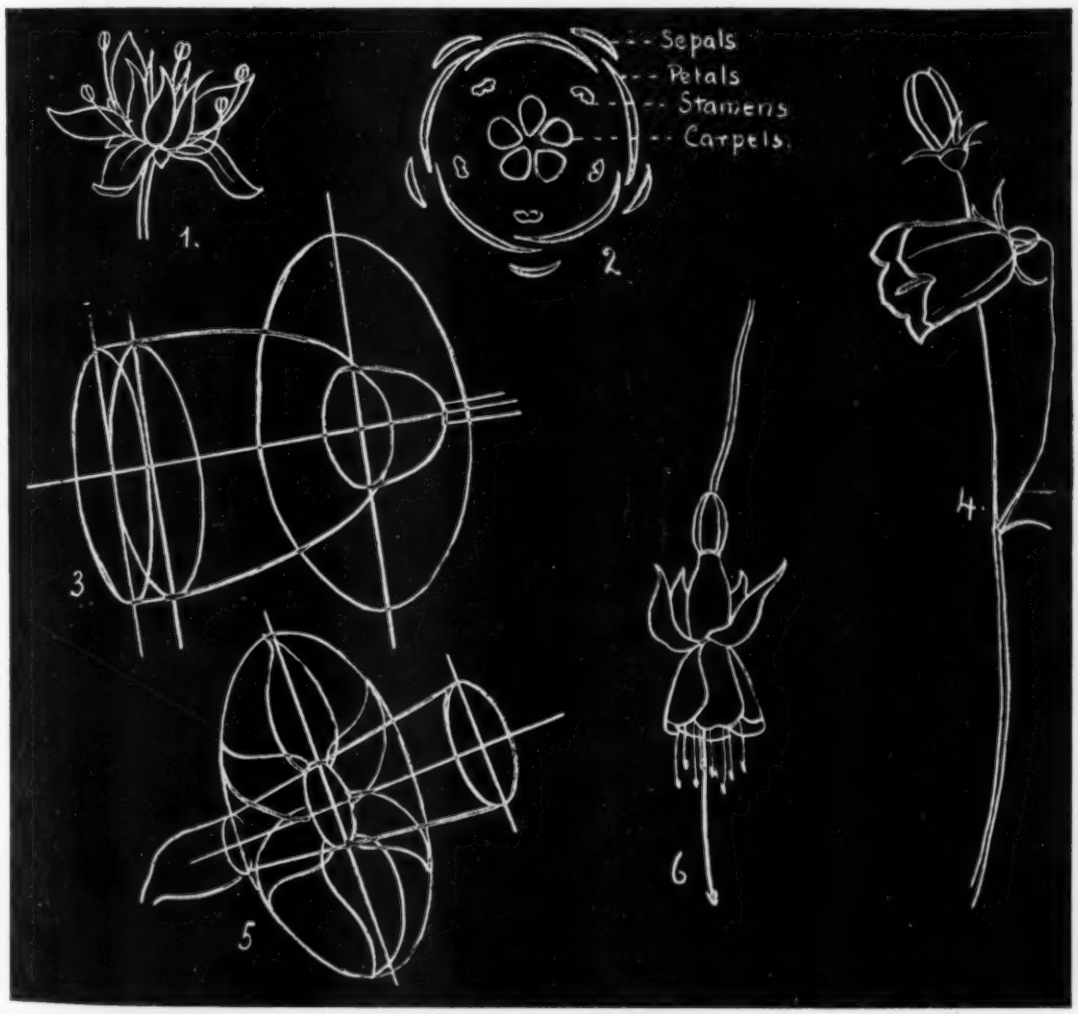
BY EDITH E. BAMFORD, ART TEACHER, EDGE HILL TRAINING COLLEGE.

VII.

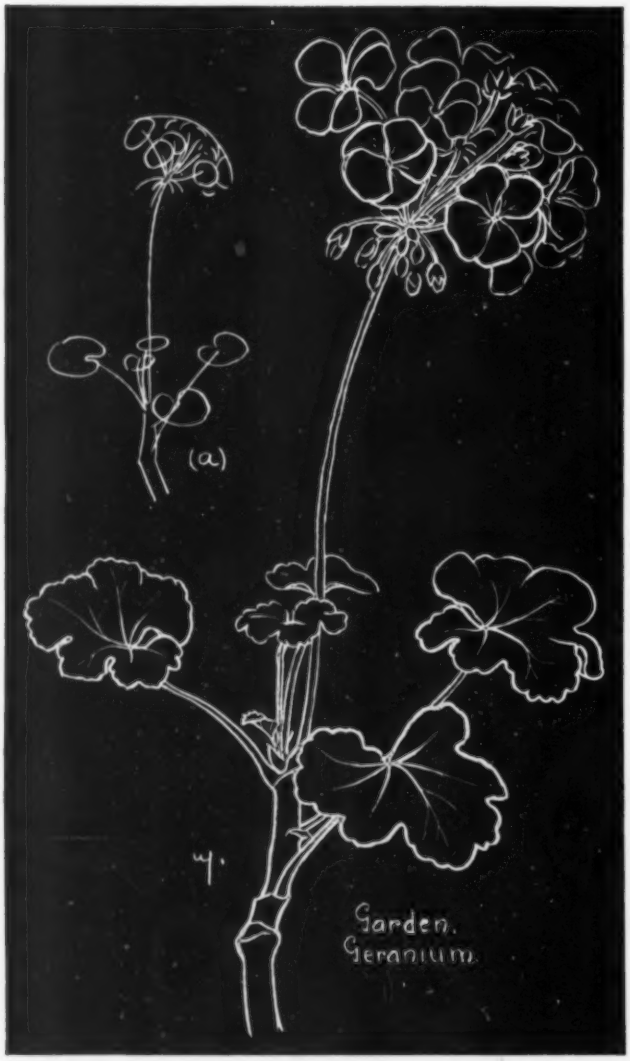
FLOWERS are, as a rule, more difficult to sketch than leaves, for even in a single specimen there must be some foreshortening. As in drawing a leaf, the parts should be very carefully examined before the sketch is made. The four parts generally present are:—

1. The calyx.
2. The corolla.
3. The stamens.
4. The pistil, which is composed of carpellary leaves.

It is essential that these parts be carefully examined, and their number and relative position noted. Even the dis-



section of a specimen may be necessary, for it is inexact knowledge of the relative position and the number of the parts that is frequently the cause of unsuccessful blackboard sketches of flowers. The four parts are generally arranged alternately, as shown in the sketch of a crassula, a good example of a symmetrical flower (Fig. 1), and as shown more clearly in the floral diagram or ground plan of the same flower (Fig. 2). There are many variations from this typical arrangement, particularly in the pistil, where the number of carpels composing it frequently differs from the other parts of the flower. In some types



these carpels are distinct, as in the crassula (Fig. 1); in others they are united to form one ovary, as in the fuchsia (Fig. 6). The stamens are often double the number of the other parts, and then these two series are arranged alternately.

It is impossible to give rules for the sketching of all flowers, as the types vary so much in form; but a few general rules can be given which may prevent some of the commonest mistakes being made. Always take as the example a typical specimen, and place it in the normal position of growth; even single flowers should be sketched in the position of growth, for this gives character to the drawing. The view taken of the flower should be the one that will show most clearly its characteristic shape and the arrangement of the internal parts. If the flowers are expanded, as in the wild geranium and crassula, a view similar to that in Fig. 1 shows the particular marks of the specimen well; if tubular, views similar to those of the harebell and fuchsia in Figs. 4 and 6 would be the best. Much of the effectiveness of the sketch depends upon the view selected for representation. It may be necessary in some cases to make a longitudinal section of the flower in order to show the position of the parts more clearly, as in section of flower (Fig. 8).

The rules learned in drawing from geometric models are to be observed even in drawing from flowers, and those used when sketching the cylinder and ring will often be needed. The application of these rules to the sketching of the harebell and daffodil is shown (Figs. 3 and 5). Such sketching produces merely a characterless drawing, for the peculiarities of form and veining are not recorded here. But if the rules of perspective be borne in mind, even though the construction lines are not actually used, they will help over many difficulties in the foreshortening of the flowers.

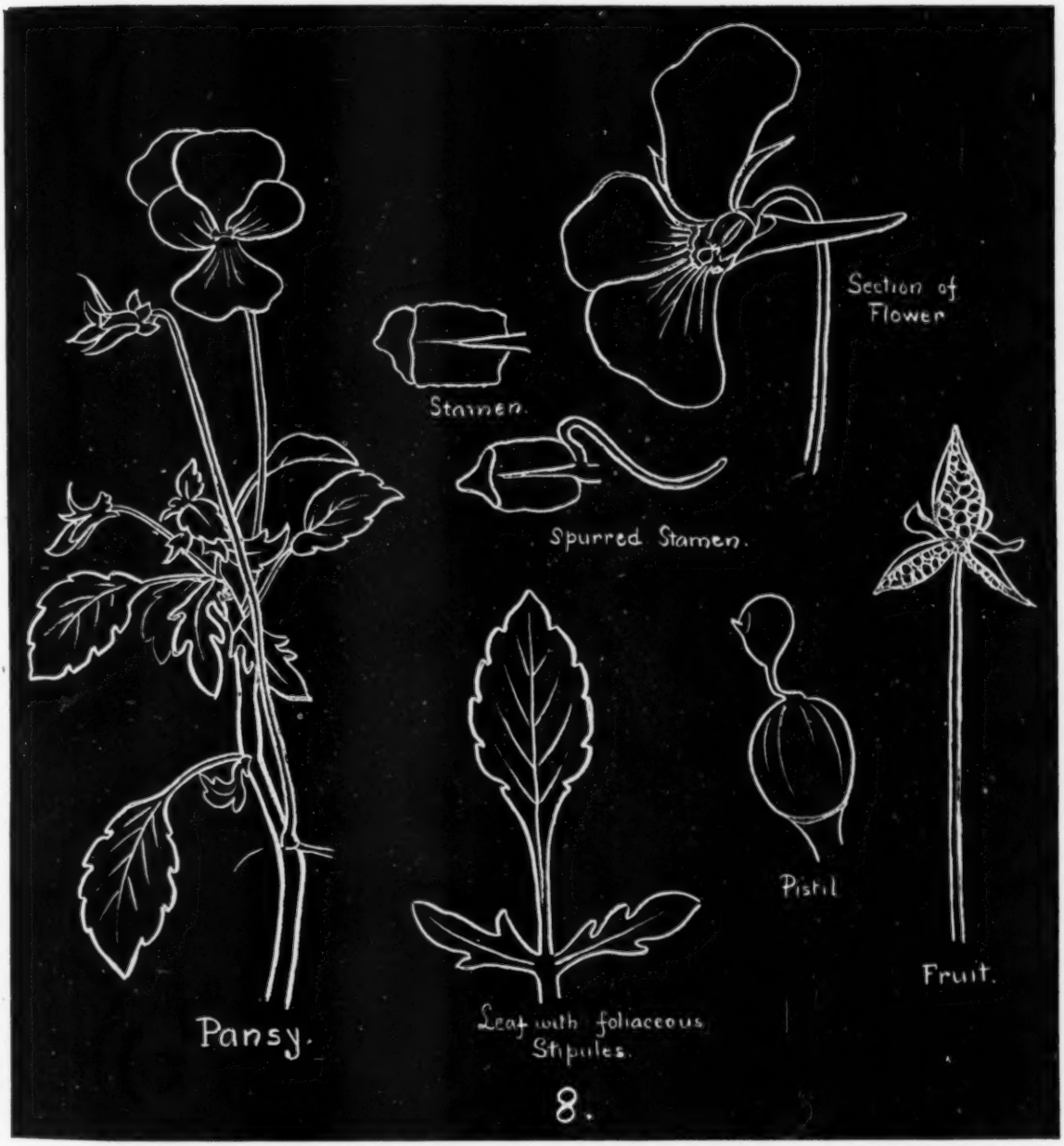
In such flowers as the daffodil and fuchsia, bad mistakes are frequently made when sketching the lobes attached to the tube, the attachment being reproduced wrongly, and the back lobes being made too long. It should be remembered that the lobes are attached all the way round the tube, and that, if flattened, the tips would touch equidistant points on a circle, so that some of the joinings and parts or all of some of the lobes would be invisible, being hidden by the tube. The lobes in the front and at the back would be very much foreshortened (Figs. 5 and 6).

The garden geranium has been taken as an example to show the method of sketching an inflorescence. The leading lines of the specimen should be drawn first (Fig. 7 *a*). The individual flowers of an inflorescence do not need such careful sketching as a single flower, for the stem and the grouping of the leaves and flowers give character to the illustration. Two or three conspicuous flowers should be strongly outlined, but the others need only be indicated by faint lines. It is a good general plan, when making illustrations of clusters of flowers and leaves, to sketch those nearest with strong white lines, and those farther away with faint lines, to give the effect of distance; this difference will make the general effect of the illustration clearer. The various qualities of the lines can be worked much more effectively in sketches on the blackboard than in the sketches reproduced here. In other illustrations of flowers, however, it is just as essential as in sketches of other subjects that the whole outline be represented by a strong white line, whilst the veining should be indicated by lines of varying thickness, as in leaves.

If a lesson on a plant is to be given, a series of illustrations should be made to show the plant and its parts. Such a series for a lesson on the pansy is sketched (Fig. 8).

A very pretty effect can be obtained by shading the sketches of flowers; the blackboard gives the dark tones, and the white chalk the high lights, the chalk being rubbed in with the forefinger and carefully gradated. Considerable skill and knowledge of shading are required; but, though the shading adds much to the effect, it is not an essential part of the illustration.

A Large Supplement,
with Thirty-Eight Original Drawings,
to Illustrate
INDUSTRIAL DRAWING, STAGE V.,
is Presented with the November No. of
THE PRACTICAL TEACHER'S ART MONTHLY.
Price Twopence.
Order from Bookseller now.



PRACTICAL ELEMENTARY SCIENCE.

AN EXPERIMENTAL COURSE COVERING THE REQUIREMENTS OF BOTH THE DAY AND EVENING SCHOOL CODES IN PHYSICS AND CHEMISTRY.*

BY THOMAS CARTWRIGHT, B.A., B.SC.,

Author of "Practical Chemistry," "'Section One' Physiography," etc.

Moisture of the Air.—All that has been said concerning the escape of moisture into the air when evaporation takes place should be recapitulated, both as a useful revision lesson, and also by way of preliminary introduction to the present lesson, which aims at the quantitative determination of the moisture in the air. Two saucers, the one containing calcium chloride, the other sulphuric acid, should be carefully weighed, after which they shou!d be exposed to the air for some time, and then they should again be weighed. The pupils should be told that these two bodies have great power of absorbing moisture, and that the gain in weight may be presumed to be due to the water vapour that has been absorbed from the atmosphere. Reference should be made to the dampness of table salt in wet weather, the reason for which is that commercial salt always contains more or less calcium chloride as a harmless impurity.

A Quantitative Experiment.—A good-sized U-tube should be packed with lumps of calcium chloride, one limb being provided with a cork carrying piece of tightly-fitting glass tubing, the two ends of which are bent at right angles, one bend being fitted in the cork of the calcium

* Books referred to in this series of articles are published by T. Nelson and Sons.

chloride tube, the other into a cork which fits the neck of a large bottle, such as a Winchester quart. This cork should be a two-holed one, and the second of the two holes should carry a piece of glass tubing long enough to go to the bottom of the large bottle. The part outside the bottle should bend over, and should have a piece of straight glass tubing fitted on to it by means of rubber tubing, so that this portion of the bend may extend below the bottom of the bottle, as it is to act as a siphon tube for emptying the Winchester quart bottle of water. When everything is ready, the calcium chloride tube should be carefully weighed, and the large bottle should be completely filled with water. Some of the water is sucked out of the bottle into the siphon tube, after which a steady current of water will flow out of the bottle, the water being replaced by air, which can only enter by first passing through the calcium chloride tube. The large bottle should be refilled, and the experiment should continue until one or two cubic feet of air has been robbed of its moisture, after which the calcium chloride tube may be reweighed; the gain in weight should be noted, and recorded in the laboratory books of the students as so many grams per cubic foot of air, and also as a percentage. The amount should be about 3 or 4 grams per cubic foot. The experiment should be either duplicated or repeated, a variation being made by filling the U-tube with lumps of pumice stone in place of the calcium chloride, the pumice being moistened with concentrated sulphuric acid. By repeating the experiment on very dry and on very damp days, it may readily be shown that the amount of moisture in the air varies considerably; moreover, it may be shown that the capacity for moisture of heated air is greater than that of cold air, and a little judicious questioning will lead to the fact that to cool air is the readiest way of causing it to deposit its moisture. To corroborate this, the moist window panes of the morning may be compared with the dry glass of later on in the day. This leads naturally to a consideration of the formation of clouds, mist, fog, rain, snow, hail, hoar frost, and dew, which should be again referred to, as should also the facts elicited in the lessons on evaporation and condensation.

Dew-Point Instruments.—The mention of dew leads naturally to the consideration of the wet and dry bulb thermometer and Regnault's hygrometer. By way of preliminary, a thermometer should be taken from its stand, and upon the bulb of it should be placed a little ether or alcohol; and the hand should be waved quickly to and fro, in order to promote the speedy evaporation of the liquid used, when the pupils should be led to observe the fall of temperature, which they should be required to explain. In order to assist them, if this is found necessary, a little of the ether or alcohol may be placed on the back of the hands of several of the pupils, who will describe what they feel—the questioning being continued until the cooling of the hand and the lowering of the mercury of the thermometer are clearly seen to be due to the latent heat of vaporisation, for the revision of which part of the course a good opportunity will thus present itself.

When this necessary prelude to the actual experiment has been satisfactorily accomplished, the dismantled thermometer and another exactly like it are to be mounted side by side on a retort stand or other convenient support. Round the bulb of one of the thermometers a piece of muslin is to be tied by placing a piece of string round the tube just above the bulb. The ends of this muslin bulb cap must reach into a saucer containing water, and now all is ready for a brisk questioning as to what is taking place. Beginning with the ends of the muslin that are in the water, it should be asked what this is to accomplish. Failing a reply, or by way of corroboration should a reply be forthcoming, one of the lads should be asked to feel the muslin outside the water, just above the saucer. The dampness thus rendered apparent should be at once associated with the passage of the oil of a lamp up the wick, with the passage of the molten wax or tallow up the candle wick, and with capillarity phenomena in general. It may be advisable to have some very fine bore glass tubes at hand, to show that water passes up these the more readily the finer they are. The next question should aim at showing what the water that is now on the muslin next the bulb will do, the preliminary experiment with the spirit or ether being brought prominently forward to help the minds of the boys towards an appreciation of the fact that the water will evaporate, and that the air round the bulb will slowly become saturated with moisture. The cold sensation should again be referred to, as should also the lowering of the mercury of the thermometer; and a careful observation of both the thermometers should follow, the temperatures that they record being duly written in the laboratory books. Why are there two thermometers? This will not be readily seen, and some little time has usually to be spent in getting the class to see that the dry bulb thermometer indicates the temperature of the normal air, whilst the wet bulb registers the temperature of the air that has been cooled by the abstraction of the heat that has been used up in evaporating the moisture from the muslin cap of the covered bulb. How can we tell when the air round the wet bulb is saturated? If this is not seen, it is because the connection between the lowering of the temperature and the amount of vaporisation is not clearly understood, and a pause should be made to render this clear. What may be inferred with respect to the condition of the air when there is a considerable lowering of the wet bulb thermometer? This must be well driven home—namely, that if the air is very dry, it can take up much moisture which requires much heat to vaporise it, and therefore causes a greater lowering of the temperature of the air surrounding the wet bulb than when we are experimenting on air which is fairly rich in moisture. What the experiment actually teaches should again and again be impressed upon the class by repeated questioning. We are only justified in saying that it teaches us whether the air is rich or poor in moisture. The actual quantitative determination has to be made by means of tables, and should not be attempted until the whole of the steps in the experiment, as set out in outline above, are thoroughly grasped by every pupil. The pupils may be told that rules have been made whereby the facts thus obtained may be expressed as so many grams per cubic metre, and also whereby the dew point may be determined; but this should be held out as an inducement to a thorough understanding of what has been actually learned.

What the Dew Point is.—This the pupils may either be told, or, better still, they may determine it experimentally. To do this, a Regnault hygrometer should be employed. This consists of two large-sized test-tubes or boiling-tubes, the inside of which has been silvered about $\frac{3}{4}$" up from the bottom—the one being empty, and carrying a thermometer through the cork with which its mouth is closed; the other containing ether or alcohol, and having its mouth closed by a three-holed cork. Through the middle hole passes a thermometer, just as in the first tube; through one of the side holes passes a piece of glass tubing bent at right angles, the bend being just above the cork, and the end passing very nearly to the bottom of the silvered tube. The other hole of the cork carries an L-shaped tube that is connected with the Winchester quart bottle used in the first experiment, the use of which is to cause a current of air to bubble through the ether in the silvered tube. The pupils should be required to tell that this disturbance of the volatile ether causes some of it to evaporate, the heat of vaporisation being taken from the air surrounding the ether-holding tube. They should also be expected to discover what has happened when the thermometer in the silvered ether-containing tube ceases to fall. The dimness of the tube bears witness to the fact that the air round it has been sufficiently cooled to deposit its moisture as dew. In order to get a more exact dew point, it is usual to note the temperature of the thermometer in the tube just as the dimness appears, and then, removing the aspirator, to take the temperature just as the film of moisture disappears, and to take the mean of the two as the nearest approximate to the actual dew point. What is the function of the thermometer in the tube that contains nothing but air? It shows what the original temperature of the air was. Suppose this is 15° C., and that the dew point is 12° C.; then a sharp lad should be able to state that the moistness of the air is such that, upon being cooled 3° C., it deposits some of its moisture as dew. The simple experiments outlined above are well within the understanding of the pupils; and the

teacher is exhorted to repeat them, and to continue his cross-examination until he is assured that the *facts*, as we have so often insisted, are firmly impressed upon the minds of the pupils, after which he will find that the calculations which we are about to describe will be entered upon with an intelligent zest. This part of the work, it may be observed, is by no means necessary, and it cannot be claimed for it that it is educational; interesting it is, however, in a high degree.

The Calculations.—Going back to the wet and dry bulb thermometer, the following table has been prepared:—

Dry Bulb Temp.	Factor.	Dry Bulb Temp.	Factor.
0° C. to 1° C.	3	7° C. to 10° C.	2·1
1° C. to 4° C.	2·5	10° C. to 13° C.	2
4° C. to 7° C.	2·3	13° C. to 18° C.	1·8

The difference between the temperatures of the two bulb thermometers is to be multiplied by the factor, and the product thus obtained is subtracted from the temperature of the dry bulb thermometer, the difference being the dew point; thus, suppose the temperature of the dry bulb is 15° C., and that of the wet bulb 12°, then

$$\text{Dew point} = 15 - (3 \times 2) = 9° \text{ C.}$$

Knowing the dew point, another table has been constructed, from which can be seen the number of grams of moisture in a cubic metre of the air experimented upon.

Dew Point Temp.	Grams.	Dew Point Temp.	Grams.
0	4·9	11	10
1	5·2	12	10·6
2	5·6	13	11·3
3	6	14	12
4	6·4	15	12·8
5	6·8	16	13·6
6	7·3	17	14·5
7	7·7	18	15·1
8	8·1	19	16·2
9	8·8	20	17·2
10	9·4		

Thus, if the dew point is 12° C., the table tells that the amount of moisture per cubic metre is 10·6 grams—a result which might be verified by working the experiment by the first method.

To Silver Tubes for Regnault's Hygrometer.—This the teacher may do by putting a solution of a tartrate—Rochelle salt does very well—in the tubes to be silvered, and by adding to this a solution of ammonium silver nitrate, made by adding dilute ammonic hydrate to a solution of silver nitrate, until the precipitate that forms just disappears. Upon warming the solution for some time, the silver is deposited upon the inside of the tube as a mirror, which will answer very well for a Regnault tube.

Applications of the Lesson.—The two most important points to refer to are the beneficial effect of the moisture in preventing the diffusion of heat into space when radiated from the earth, whereby the earth is rendered habitable; and the soothing effect of the moist atmosphere upon the human skin, whence the provision of moisture in rooms that are heated by hot-water pipes.

THE NEW FREEHAND.

Generally considered the best reproduced in the market.

Photographic Representations of Casts. Meeting the requirements of the New Freehand Syllabus. By B. C. HASTWELL, contributor to *The Practical Teacher's Art Monthly*; Art Master, Pupil Teachers' Schools, London School Board. Beautifully printed on the best paper. Set of 12 Sheets. Price 2s. 6d.

Each sheet contains (*a*) photographic representation of cast, (*b*) key sketch in outline, (*c*) finished sketch in outline.

Adopted by the London School Board.

T. NELSON AND SONS, 35 and 36 Paternoster Row, London, E.C.

ELEMENTARY LESSONS IN THE PRINCIPLES OF GRAMMAR.

A Course of Forty Oral Lessons for the First Year (New Code, Standard IV.).

BY JOHN R. TIMSON, B.A.

LESSON XXXIV.

APPOSITION.

WE often give a thing more than one name by way of description or explanation, as—

The *river Tiber* is in Italy.
Tom, the butcher's *boy*, carries meat.

"River" and "Tiber" mean the same thing. "Tom" and "boy" mean the same person.

When two or more names in one sentence are used in this way, the second and other names are said to be in apposition to the first name—that is, in position side by side with it.

All names in apposition indicate the same thing, therefore all the distinctions in names which come from the thing itself will be one and the same for all the names. These distinctions are gender, number, and person; and nouns in apposition agree in these particulars.

The man is a tailor, draper, clothier, and hatter. Man, tailor, draper, clothier, hatter are all names for one and the same person. They must therefore be of the same gender, number, and person.

In one sentence they will all indicate the subject, the object, or a possessor. Hence nouns and pronouns in apposition are in the same case.

The first name is parsed as though it stood alone, as—

The river is in Italy.
River.....Nominative case to "is."

The second and remaining names are in the same case, as—

The river *Tiber*, a muddy *stream*, is in Italy.
Tiber.....Nominative case, in apposition to "river."
He went to London, the capital of England.
London ...Objective case, governed by "to."
Capital....Objective case, in apposition to "London."

A second name is often asserted of the subject, as—

The man is a beggar.

"Man" and "beggar" mean the same person.

"Beggar" is nominative case after the verb "to be."

Remember that the verb "to be" takes the same case after it as before it, because the names indicate the same thing.

Other verbs take names after them indicating the same things as the names before them, as—

He seems a good *workman*.
Tom becomes an *apprentice*.
The *beggar* was made *king*.
She is called *Mary*.
The *soldier* was taken *prisoner*.
The tallest *man* was appointed *king*.

The name following the verb is said to be "nominative case after the verb." The pronoun "it," used for the subject, is often explained by a verb in the infinitive mood, as—

It is pleasant *to play*.

"It" means "to play."

You will readily supply other examples. Sometimes "it" is used to name what is unknown or not defined.

"It" is then called an indefinite pronoun, as—

It rains. It is snowing. It is cold.

If a person is addressed by name, the noun is said to be nominative case of address, as—

Tom, did you speak?
Tom.....Nominative case of address.

MEMORY NOTES.

A noun or pronoun in apposition to another must be in the same case.

The verbs "to be," "to seem," "to appear," "to become," "to call," "to name," often take a noun after them which stands for the same person or thing as the subject, and is therefore nominative case.

The pronoun "it" is said to be "indefinite" when its meaning is not fixed, as—It rains.

The pronoun "it" is often explained by a verb in the infinitive mood, as—It is wrong to steal.

Nouns and pronouns used to address a person are said to be nominative case of address.

A SPECIMEN SCHEME OF OBJECT LESSONS.

BY W. DONE, B.A., HEAD-MASTER, BRIGHTON PUPIL TEACHERS' SCHOOL.

I.

ONE can hardly realise as yet the great emancipation which the new Code has brought to the children and to the teachers in our primary schools.

To think that the old shop-keeping principle of paying for education at so much a pound has departed, and that the teacher is to be allowed to originate his own plans for the proper development of the faculties of the young ones committed to his charge, seems almost Utopian.

That the last remnants of the old Robert Lowe Code have finally departed is further emphasised by the explanatory memorandum accompanying the specimen schemes of instruction recently issued by the Board of Education. We are told that "the first object of the alterations in the Code is to extend the liberty of classification and of the choice of methods of instruction which teachers already possess. The other object, not less important than the former, is to *make the course of instruction in all schools more comprehensive, so as to give all scholars the rudiments of general information, while enabling the details of the instruction to be adapted to the special needs of various kinds of schools.*" Again, we are told, "If the scheme of lessons is made more comprehensive, the lessons in each branch of learning need not include such minute details as when fewer subjects were studied..... The introduction of a wider and more generally interesting course of instruction will, it is hoped, be a welcome relief from the continued repetition of the restricted course of lessons, which has a tendency to become lifeless and wearisome."

This new state of things, leaving so much to the initiative of the head teacher, will throw more responsibility on to his shoulders. It is hoped that the following suggestions will be of some use under the circumstances. Of course there will not be much rearrangement required in the teaching of reading, writing, and arithmetic, because all children must learn to read, they must learn to express their thoughts correctly in writing, and to acquire some mastery in the processes of arithmetic. It is in the lessons in Elementary Science and Common Things, which must vary with different localities, that some difficulty may be experienced.

We will select, first, the case of an average school in a seaside town. Suppose such a school chooses the following scheme put forward by the Department:—

SCHEME 5, FOR BOYS' SCHOOL IN SEASIDE TOWN, WITH AVERAGE ATTENDANCE OF ABOUT 170.

Staff—Head Teacher, Two or Three Assistant Teachers and Pupil Teachers.

	Class 5.	Class 4.	Class 3.	Class 2.	Class 1.
English.	Reading from suitable books. Recitation. Oral formation of very easy sentences. Transcription.	Reading from suitable books. Recitation. Formation (both orally and in writing) of easy sentences. Transcription.	Reading from suitable books. Recitation. Formation of sentences as in Class 4. Writing similar sentences from dictation.	Reading from suitable books, one of which should be a History of England. Recitation. Formation of sentences and writing of sentences as in Class 3. Letter-writing.	Reading from suitable books, one of which should be a History of England. Recitation. Reproduction in writing of passages read by children, or of stories told by teacher. Letter-writing. Grammatical rules bearing upon composition. Easy dictation.
Arithmetic.	As for Standard I. in Schedule I.	As for Standard II. in Schedule I.	As for Standard III. in Schedule I.	As for Standard IV. in Schedule I.	Group (*a*) as for Standard V. in Schedule I. Group (*b*) as for Standard VI. in Schedule I. Group (*c*) as for Standard VII. in Schedule I.
Geography.	Lesson on Geography of the neighbourhood.	Outlines of England. Geographical definitions as they occur.	Outlines of British Isles.	Outlines of one of the Continents, say Europe.	Outlines of Asia, Africa, and America (in turn), with special reference to British possessions.
History.	.....	Stories from period before 1066.	Stories of period 1066-1485.	Exposition of contents of History of England, used as reading book.	Exposition of contents of History of England, used as reading book.
Elementary Science and Common Things.	A course of lessons on marine animals and plants, on local rocks, pebbles, etc.; various sorts of boats, ships, etc.; lighthouses and lightships; the local tides; flags of different nations, etc.			The magnet and compass. Practical methods of finding the cardinal points. Apparent movements of sun and moon. Measurement of sun's altitude by shadows.	Practical measurements of areas and volumes; lever; pulley; inclined plane; practical examples of parallelogram of forces and parallelogram of velocities. The chief constellations, and the apparent movements of heavenly bodies.
Drawing. Singing. Physical Exercises.	As under former Codes.				

For Classes 3, 4, and 5 I should suggest the following course of lessons, quoted under the title of Common Things:—

1. Study of the seashore: rocky and sandy coasts.
2. The rise and fall of the tide.
3. Breakwaters and groins.
4. Lighthouses and lightships.
5. Soundings and dredging.
6. Harbours.
7. Currents.
8. Drifting sand and shingle.
9. The effects of frost on the cliffs.
10. The stones on the beach: water-worn pebbles.
11. A boat: its shape and parts.
12. Sailing vessels: schooner, brig, barque, full-rigged ship.
13. The parts of a sailing vessel.
14. } The mariner's compass.
15. }
16. The steering-gear; the lubber-line.
17. } How the captain finds his course, and first notions of
18. } latitude and longitude.
19. }
20. A storm at sea.
21. Storm signals.
22. Sea water, and how it differs from fresh water.
23. The general structure of a fish, and how it is adapted to move through the water.
24. How fish breathe.
25. Fresh-water fish; salt-water fish: common examples.
26. Shell-fish.
27. Seaweeds: sea-lettuce or green-laver.
28. Seaweeds: bladder-wrack.
29. Red seaweeds.
30. Flags of different nations.

OUR ILLUSTRATED GEOGRAPHICAL NOTEBOOK.

THE BATTLE OF THE TONGUES.

The English Language.

WHEN the history of the nineteenth century is written, it will contain nothing more noteworthy than the phenomenal extension of the use of the English tongue, and the remarkable manner in which it has outstripped its Continental rivals.

French was the leading speech of the world when the century dawned, with Russian and German following very closely; Spanish was fourth in the race. English was on the lips of less than twenty-one millions of people, and of these quite three-fourths consisted of inhabitants of the British Isles. There were but five millions of English-speaking people in all the rest of the world, and most of these were in the United States, the British colonies accounting for less than three-quarters of a million.

The whirligig of time has wrought a marked change, and it is a fact now that "only speak English loud enough and it will be understood over all the world." A hundred and twenty millions of people are to-day speaking English, of whom no less than eighty millions are outside the United Kingdom. Cousin Jonathan has increased from five millions to sixty, and the Colonies now contain twenty millions speaking English, as compared with 730,000 in the year

1800. The German, Russian, and French languages also show remarkable growth, but it is almost solely the outcome of the natural increase in their home populations. Spanish, although it has fallen to the fifth position, is the only language that can throw down the gauntlet to English in respect of growth outside its own borders. This is chiefly accounted for by the increase in population in South America, where Spain so long held sway. More than half the Spanish-speaking people are outside Spain.

Even in this respect the potentialities of growth rest with English; for whereas the growth of Spanish is confined to South America, English is spread over the whole habitable globe, and is already the master tongue in vast territories that will form the future homes of untold millions. That the coming century will show yet more remarkable increase of English is but compatible with the growing dignity of the British Empire, "whose morning drum-beat, following the sun or keeping company with the hours, encircles the globe with one continuous strain of the martial airs of England."

Whether English will ever become the universal tongue is a probability too remote for profitable discussion, and the British schoolboy will not yet be freed from the necessity of assimilating foreign languages. The population of the world is 1,500,000,000, and will allow plenty of scope for the growth of our mother tongue, even if the ratio of progression should increase by still greater leaps and bounds. One hundred and twenty millions of English-speaking people! Our breasts thrill with pride, but the reflection that four hundred millions of people speak Chinese* is but one example that may be adduced to moderate exaggerated ideas of our own importance. It is a remarkable fact, too, that a large number of home-born Britons are unable to speak the English language. The census of 1891 recorded over half a million persons who spoke only Welsh, 43,000 Gaelic, and 30,000 Irish.

One possibility, however, is not without reasonable grounds of fulfilment. "Not more than a century or two distant lies, in the possible, not in the certain future, an alliance (I do not say a union) of all English-speaking peoples—Great Britain, the United States, Australia, India—belting the globe, and possessed of power to strike a universal peace through half the continents and all the seas."

THE DYAKS.

At one time Europeans applied the term "Dyak" to all the natives of the island of Borneo. This island, however, has an area of 280,000 square miles, and it contains races of marked dissimilarity. The Dyaks are found chiefly in Sarawak. Rajah Brooke classified them as Land Dyaks and Sea Dyaks. The former are small, slight in build, with straight black hair, and the colour of Malays; the latter are more stoutly built; and the language of both resembles Malay.

The Dyaks are said to be above the Malays in mental capacity, and their moral superiority is even still more marked. They are very low and degraded notwithstanding, but easily raised, as they possess no religious or caste prejudices.

Though there are innumerable traditions, legends, and fables handed down orally from generation to generation, there is no regular religious belief, although many of the customs seem to imply a belief in a future state. Of these the best example is the Festival of Departed Spirits.

"The guests arrive during the day, and the feasting begins in the evening, and lasts all night. An offering of food to the dead is put outside at the entrance of the house." The spirit of the winds is invoked "to invite the dead to come and feast once more with the living," and they are supposed to arrive about dawn. The climax of the festival is reached when a specially selected aged guest drinks a quantity of spirituous liquor from a bamboo. The dead are supposed to share in this liquid, and the risk to the living is supposed to be very considerable.

The sociability of the Dyaks is beyond question, since from five to fifty families will herd together under one roof, and, what is more, will live in peace. This mode of life was the direct outcome of the necessity of organising against the incursions of enemies.

Sometimes a village with a population of a thousand souls will consist of two great houses, each some five hundred feet in length, erected on stakes, and only approached by means of ladders. A common room occupies the whole front of the structure, from which many doors lead to separate family rooms at the back. On a platform along the front all domestic labour is carried on, and the domestic animals are accommodated. Under British protection this mode of life is obviated, and there is every probability that the Dyaks will prove no inapt pupils of civilisation.

* But the inhabitants of one province cannot always understand those of another.

THE INSPECTOR'S NOTEBOOK.

BY AN INSPECTOR OF SCHOOLS.

THE RURAL SCHOOL.

Circular 435 is worth reading. LET me begin this month's notes by inquiring of my rural readers whether they have seen the specimen schemes of the Board of Education, and whether they have read Circular 435, issued in April last, dealing with the curriculum of the rural school. I make these inquiries purposely, as I firmly believe very few know anything about these important documents. My first advice to all rural teachers is, "Procure copies of these at once and study them."

You may find them in the latest N.U.T. edition of the 1900 Code (Yoxall and Organ). The schemes are not in the earlier edition. The education of the rural school is sadly behind that of the town school. The idea is to level up the country districts. Want of money is undoubtedly the most serious drawback. Little of a thorough nature can be done until the financial problem is dealt with effectively.

The Syllabus should accord with the Child's Environment. For the present we must do the best we can with the ways and means available. Let us hope that in the near future the small village will take a greater pride in the efficiency of its school than in a low rate. I am sorry to say that we are as a nation far behind in this matter. Our business is, however, with the inside of the school, so let us consider Circular 435. Here it is in brief. The Board of Education is anxious to encourage managers and teachers to construct curricula suited to the environment of the scholars. They do not advise technical instruction, as, for instance, in practical agriculture; but the children should be brought into contact with the surroundings of ordinary rural life, and be taught to observe the processes of nature for themselves. The instruction should be less bookish. The use of the simpler gardening tools might be taught practically. To bring about this end, it is thought that the object lesson instruction should bear upon the child's daily surroundings. (See Circular 369.) These object lessons should be "constantly illustrated by simple experiments and practical work in which the children can take part."

The object lesson instruction should be connected with the drawing lesson and the composition lesson.

Wherever feasible, the elder scholars should do work outside the school, such, for instance, as—

1. Elementary mensuration.
2. Making sketch plans of the playground, etc.
3. Drawing common objects.
4. Paying visits to woods, lanes, ponds, farms, etc., under the guidance of a teacher.
5. Cultivating a school garden.

School walks are recommended.

The above foreshadowed methods are expected to quicken the child's intelligence. Finally, all rural teachers who are of urban upbringing are exhorted to seize every opportunity to get into touch with rural life, so that they may become the better exponents of rural ideas and thought.

Ignorance is not always justifiable. A few days ago I visited a very energetic rural teacher. He submitted for my approval his list of object lessons. I simply said, "Have you read Circular 435?" He had not, as I could plainly tell from the incongruous and unsuitable items jumbled together in his scheme. He had not even consulted that valuable Circular 369. The old Romans regarded ignorance of the law as culpable. Is there any excuse for rural teachers who ignore help that is offered them free? The boys of this school were actually receiving instruction as to the various kinds of glass and its manufacture, whilst they were at the same time ignorant of the names of the trees growing around the school. And the teacher was certainly not of urban upbringing. The children of every rural school should be taken outside the school this very autumn and be brought face to face with nature. What a magnificent lesson upon the fruits of trees can be given in the lane within the shadow of the school! There are the hips, haws, blackberries, sloes, chestnuts, rowan berries, acorns, and beechnuts lying in profusion outside. Why stay indoors and vainly endeavour, by means of words, to picture their beauties?

Suggested Course of Object Lessons—I. Let me suggest a course of object lessons. (You will have noticed that the object lessons are to be given to the whole school.)

1. The farm: its buildings and their contents; animals kept on a farm.
2. Spring-time: spring flowers; work in the fields in spring; the cuckoo and the swallow.
3. Local wild-flowers of spring.
4. Summer-time: lessons on the common trees and fruits; work in the fields in summer.
5. Autumn: work in the fields; the changing of the colour of the leaves; the shortening of the days; the heavy dew at morning and night.
6. The trees in autumn; the seeds of these—namely, the acorn, chestnut, beech-mast, rowan berry, hips, haws, etc.
7. Local wild-flowers of autumn.
8. The garden in autumn.
9. Winter: frost, ice, snow; the condition of the trees; evergreens; the long nights and short days; the garden and farm in winter.
10. The weather and the wind.

"The lessons of the seasons should correspond with the actual seasons of the year, and the different operations explained should be taken while each is in progress."

The above course, which is selected from the Board of Education's excellent Circular 369, is founded entirely upon the seasons. These lessons will be found ample for one year.

Course II. Then you may want an alternative course, especially as you are giving these to the whole school.

1. A visit to a dairy.
2. A visit to the blacksmith's shop.
3. A visit to a ploughed field.
4. A visit to a meadow.
5. Grass farms and arable farms.
6. Cattle-rearing and corn-growing.
7. The land: woodland, meadow-land, ploughland, moorland.
8. Local wild animals: rabbit, hare, fox, hedgehog, mole.
9. Our village.
10. The carrier's cart.
11. The cottage garden.
12. The tools used by a farmer.

This course, too, is made up from Circular 369. My idea is that the children shall receive at least one-half of their object lessons out of doors.

ANSWERS TO CORRESPONDENTS.

Primrose.—I should advise you to reside at Bangor for the year. Your question is a difficult one, as I do not know what you mean to include under the head of cost. What about your loss of income, for instance? Write to Bangor and ask the entrance fee, and allow yourself £10 pocket-money. If you live at home, add the railway fare.

A.—Yes, men can qualify under Schedule VIII. The A.C.P. is not equivalent to the Certificate Examination.

T.A.S.—Yes; but it would be risky, as, if you failed in physiography, your chemistry marks would not count.

H.A. W.P.—The St. Andrews L.L.A. is not accepted in lieu of certificate. By all means go in for the Certificate Examination first.

S.—I agree with your parsing of the word "there." It is merely an introductory word in that sentence, and has no adverbial force.

T.R.R.—Children over six may be admitted into the upper school. There is no rigid rule. The subjects named are for infants. My reply *re* registers is for a Scotch teacher.

Kippax.—You must take the advanced stage again.

Correspondence should be addressed—Inspector, care of the Editor. For replies by post, a stamped addressed envelope must be enclosed.

NATURE LESSONS FOR INFANTS.

HOW ANIMALS AND PLANTS PROTECT THEMSELVES.

II.—SOME HIDING-PLACES OF ANIMALS.

Preparation.—A few birds' nests and galls of different kinds can easily be obtained for these lessons. Also, it will be good to show pictures of the animals mentioned, even though they are familiar to most children.

Introduction.—In our last lessons we saw how many enemies animals have, and therefore how much protection they need for themselves and their little ones. We then found how wonderfully nature has helped many of them in this, by giving them colouring so like their surroundings that they can to a great extent go about unobserved. Even with this help, animals have to keep a sharp lookout, lest their foes discover them.

Draw from the class how tiring this would be if it went on for very long at a time; and help them to suggest the need for rest, and a safe place in which to sleep.

Birds.—Trees make a sufficient hiding-place for most birds, as they can fly away very quickly if seen; but the baby birds can-

FIG. 1.—SAND-MARTINS' NESTS.

not do this: besides, both they and the little eggs would fall off the branches of the trees; so nests are built in which to keep them safe from harm. Remind the children how difficult it is to see a bird when it has flown into a tree; ask where the eggs

FIG. 2.—MOLE-HILL.

are hidden. Let the children examine a nest and say how it is that they are so hard to find.

All birds do not build nests in trees. The *martins* burrow

FIG. 3.—SEA ANEMONES.

tunnels in sandy cliffs, and hide their little ones in them. If bigger animals see the holes, and try to get in, they cannot do so, because the sand is so loose that it would break away with their weight. Draw sand cliff with martins' nests on blackboard. (Fig. 1.)

The *kingfisher* has his home also in a hole in a bank, but his is always in the bank of a stream; and he does not make a hole for himself, but uses one that a rat has made and deserted.

Refer also to birds whose hiding-places are rocky ledges high up out of sight—eagles, puffins, etc.

Four-footed Animals.—It would take too long to tell of the homes of all the wild animals that live in other countries, so we will speak only of a few of those that live in England. Let the children name some of those they know.

Squirrels use the inside of hollow trees to hide in during the winter, when they go to sleep. Sometimes, when putting a

FIG. 4.—NEST OF TRAP-DOOR SPIDER.

hand into the hollow trunk of a tree, one may be fortunate enough to feel a lovely, soft, warm ball; then we shall know we have found out one of the squirrels' hiding-places.

The *fox* makes only a rough rounded hole for his young cubs, but then he makes it in a very out-of-the-way place, where he thinks no one is likely to find it.

Rabbits' holes are very easy to see, but the hole is only one of the doors of his hiding-place, and he makes a long, narrow, winding tunnel, so that if we could make ourselves tiny enough to run down the hole after him, he could escape by another door, of which we did not know, while we were looking for him. Tell the children a little about Alice in Wonderland.

One of the most wonderful of all the homes made by English four-footed creatures is that of the *mole*. It has seven or eight highroads leading to it, and so many passages in it that any one but the mole himself would be sure to get lost, and find it

as difficult to get out as it is to find the gate of a maze when one has once got in. Draw a molehill on blackboard. (Fig. 2.)

Rats and *mice* choose very strange places in which to hide—the walls of our houses, the jars in which things are kept; some have even been found hidden inside a loaf of bread. Let the children tell some of the places they know where rats and mice have hidden.

Sea Animals.—Many of these hide under the seaweed in the rock-pools, or under ledges of rock; while some cover themselves with sand when any enemy comes near, so that they may not be seen.

Some *sea anemones* are very difficult to get, for as soon as they feel a touch they begin to sink into the sand as quickly as possible: and so far down do they go that none of their ordinary foes can get at them. Draw anemones on blackboard. (Fig. 3.)

Sand-crabs do very much the same thing, only they do not wait to be touched. If they have any reason for fear, they push their back legs backwards and downwards in the sand, and pull their wedge-shaped body down in a slanting direction till there is nothing left uncovered but the sharp front edge of the shell and the funny stalked eyes, which are watching anxiously.

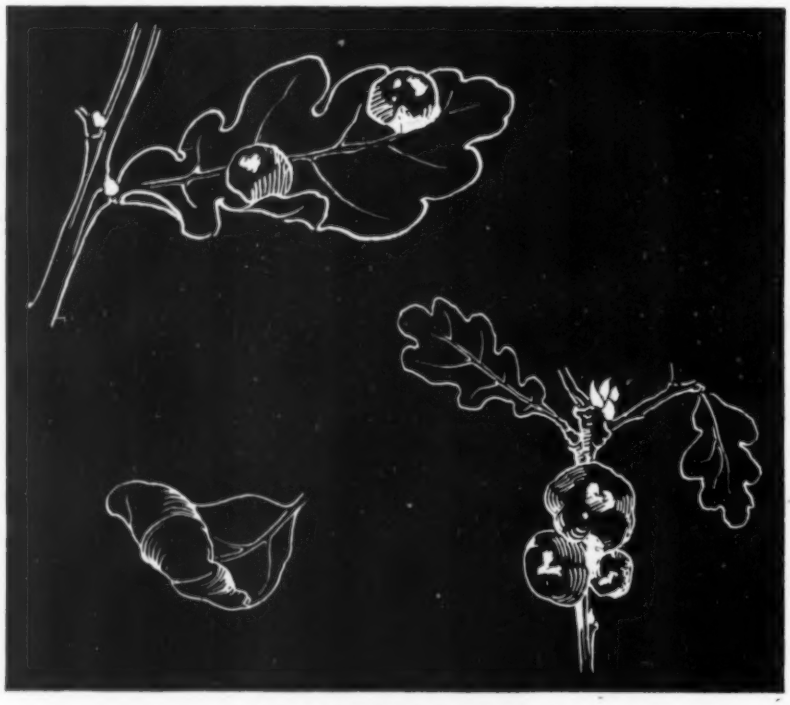


FIG. 5.—OAK-GALLS AND CURLED LEAVES.

Spiders do not generally trouble much about making hiding-places; some of them, however, make lovely little silk-lined tunnels. There is one clever little spider, who does not live in our country, who makes a long tunnel with a trapdoor to it; the door is joined by a little silk hinge, and when it is shut the hole cannot be seen. If the spider is inside, and feels some one trying the door, he hooks his back legs to the lid, and his front ones to the side of the tunnel, and then pulls, so that no one can get in. Draw home of trapdoor spider on blackboard. (Fig. 4.)

Insects.—We should expect to find insects too small to be able to make tunnels or rooms in which to hide; but nearly all insects spend part of their lives in some such place. The *oak apples* and other galls on leaves or twigs are the homes of little insects. Let the children examine some galls and curled leaves and find the little creatures inside. (Fig. 5.)

The grub of the *caddis fly* makes for itself a little case of sticks or grasses, in which it can hide in safety.

Remind the children of the homes of bees, of the wasps' nests, and the ant-hills; tell them it would take more lessons than there is time for in school to talk about all these. Suggest that the children should play hide-and-seek sometimes with those creatures which can hide so cleverly, and see if they cannot find some of their secret places.

KINDERGARTEN:

WHAT WE UNDERSTAND BY KINDERGARTEN, AND HOW WE TRY TO CARRY OUT ITS PRINCIPLES.

BY MRS. R. A. CASHMORE, HEAD-MISTRESS, GOODRICH ROAD BOARD SCHOOL, LONDON.

I.

AN extract from the writings of an ardent follower of the kindergarten system says:—

"It is easy to see how naturally the name 'Kindergarten' was adopted by Froebel.

"In all his thoughts on education, the illustration constantly present to his mind was that of the growth of plants. He used to say, 'The tree is my teacher;' and he held the work of the gardener to be very similar to that of the educator. In an oft-quoted passage he expresses himself thus: 'As the farmer and gardener treat their seeds in accordance with Nature, and in harmony with her laws, so we should educate the child and man according to their being, according to the inherent laws of life, in harmony and in unity with Nature and with the Supreme Being—Source of all life.'

"The gardener imparts no force, establishes no laws, but, after making himself acquainted with the nature of the plants under his care, secures for them, by his watchful toil, plenty of light, air, water, and space, sure that the leaves, flowers, and fruit will appear in due time. And so, in the case of children, the teacher first acquires a true ideal of what they may become, and afterwards simply gives scope for the quickening and strengthening of their varied capacities. When, then, Froebel had planned a training place for infants, he called it a 'Children's Garden,' expressing thus his educational principle, and conveying a beautiful idea of the kind of influences to be exerted there—such influences as may be reasonably compared to the sunshine, rain, and good soil by means of which plants thrive and grow.

"I may add that no forcing is consistent with his system; open-air gardening he accepted as a comparison, but not the artificial methods which promote rapid results, for he knew that all healthy development is slow."

This, it must be admitted, is a very idealistic, short description of the system of kindergarten teaching; but it must also be conceded that the comparison of the gardener with the teacher is not quite apposite, so far as the elementary teacher is concerned, and could not be followed in its entirety, for the following reasons:—

The gardener has not sixty, or seventy, or sometimes even more plants to attend to at the same time—he concentrates his thoughts and attentions on one plant; neither does he accord the same kind of food and treatment to every one of his sixty or seventy plants.

He knows just the kind of soil, food, etc., each one of his plants requires, because he knows the nature of his plants as he knows the stock from which they sprang.

The teacher, on the other hand, does not know the child's antecedents, physical aptitude, home surroundings and influences, which are the very essence of knowledge in the child's guidance, and therefore cannot always judge of the best food required for the development of her pupils, for she has to give the same kind of food to the sixty or seventy,

and certainly cannot observe the mental digestion of the sixty or seventy at the same time. Again, plant life offers no resistance: there are no inward forces but those of the general characteristics of its species to contend with; and besides these, the plant is entirely passive in the gardener's hands.

This, we all know, is not the case with children in the elementary school; for minds, mental capacities, dispositions, and moral sense differ quite as much as their physical characteristics.

Froebel's methods or gifts were designed for the individual, and we in our elementary schools have to deal with the mass, for even now our classes approximate more nearly to a regiment than to an ideal kindergarten class of one or two. Where Froebel's occupations are taken in a large class, they very often develop into mere mechanical pastimes: of course, in this, as in every other case, everything depends on the teacher.

I do not deny that they are deeply educational under certain conditions, and one of these conditions would be constant, unbroken attendance, in order to keep up the thread or connection of the occupation—and how seldom that occurs in our schools is, alas, a truism known to us all; for the occupations are so systematised that it is not easy for children to pick up the thread of an occupation when they stay away two weeks out of four.

Feeling thus, then, about the matter, we have, after a long and varied experience in dealing with infants, been bold enough to shake off the shackles and think and act for ourselves, keeping those occupations of Froebel that best answer our purpose of aiding in the child's development, and devising others that seem more valuable for a large class. And here I should like to say that any one who reads carefully Froebel's *Education of Man* will agree with me that Froebel himself would have been the very first, had he ever realised an English elementary school, to devise other and more suitable occupations for a crowd of children as well as for the individual.

I hope I shall not be considered too unorthodox when I state that we should take Froebel more as a guide than as a god; and though, like the village preacher in the "Deserted Village," he "allured to brighter worlds and led the way," still I think that "way" should be of the broadest possible, and not consist of one narrow groove or railway track, as is often the case when Froebel's methods are so blindly insisted on. It has been proved beyond a doubt that he was wrong in his method of teaching drawing, for in his squared system he certainly puts a bridle on the child's manipulative exercises, and also gives a distorted representation of the natural objects drawn; and if he is doubtful on that point, may he not be also in some other of his methods?

Lastly, I would say that the age, time, conditions of school life are vastly different—and surely we should move with the times—from what they were when Froebel lived and did such splendid service for the future generation.

As regards the aims in carrying out the kindergarten principle at Goodrich Road Infants' School, the one desire is the harmonious development of all the child's faculties so as to ensure *mens sana in corpore sano*, though, in dealing with so many children, this is no doubt imperfectly attempted, and more imperfectly carried out; but still the attempt, as far as possible, is made.

We do not strive for results, but do not despise them; but oh that the word with the idea could be expunged from the language in dealing with the children! How much unhappiness, misery, and stunting of children's body, soul, and mind has been caused by this abnormal striving after so-called "results." "Results" are not dead. The "hydra-headed monster" still lives and flourishes, for far too long has been his sway; and the rod still buds which he has held over the teacher all these years; and the poor little grant-earning machines and mediums for testing a teacher's powers and ability to earn his daily bread still remain—if not in print, still in tradition and practice: for it is just as difficult for a teacher to throw off a bad method in teaching or to acquire a good one, as for a thorough-going old Tory, steeped to the eyes in Conservatism, to acquire Radical ideas; and just as difficult for a teacher to acquire a sense of humour—that most potent factor—if she has it not naturally in dealing with children, as it is for children to forget the discouraged efforts and the habits of unhappiness engendered when results are placed first and the child "anywhere."

I firmly believe that happiness in its environment is as necessary to a child's growth as air and food. "A child's heritage of joy" should be the motto for a teacher quite as much as the Froebelian one, "Let us live with our children."

The commercial spirit has so dominated our educational system that years must elapse before we can eradicate its evils. Thank God, a happier state of things is now possible, but "they who have walked in darkness" do not always find the light easy.

The school consists of a large hall and six classrooms, and is built to accommodate 498 children. As I said before, the chief aim is the harmonious development of the children, the physical, spiritual, moral, and mental needs being provided for in turn.

The ages of the children range from three to eight years. The children are assembled in the large hall at 9 a.m. for prayers; sometimes a hymn is sung, and sometimes selections from sacred music—"The Creation," "Gloria," etc.—are played on the piano. I believe there is an innate love of music in children, for very seldom do we find a child who displays indifference to it, be it sacred or secular.

A few combined movements of all the classes at the command of the head-teacher give the idea to the children that prompt obedience throughout the day is expected from all, and also an idea of obedience to the laws which govern a community is conveyed, as well as an exercise for training of the will-power. Thus, if a careless or indifferent child does not instantly perform the exercise demanded of him, he is appealed to in some such manner as this—that the body is the servant of the mind, and he *can* make his hands, feet, etc., move just as he wishes; and he is encouraged to show that he can make his body do just as his mind directs. These few combined movements of most of the school have a good effect on the discipline in the classrooms afterwards.

To the accompaniment of music the children march to their various classrooms for the Scripture lesson, which consists of simple stories from the Bible, with any lesson that may be drawn applicable to child life.

Physical exercises based on the Swedish drill system, sometimes with, sometimes without music, are then taken for five, ten, or fifteen minutes, according to age, every day, on the principle that physical culture, to be effective, must be regular and systematic; and the only right time, it seems to me, for little children to "drill" is after repose, when their little bodies are unwearied and fresh.

Reading, as being what we consider the most difficult thing for a child to master, is then taken throughout the school in varying stages, the method being based on "sounds." But the anomalies of the language prevent this being followed entirely; so when an irregularity occurs, we deal with it as such.

I should like to emphatically say here that this is the only time during the day that reading is taken; and on H.M. Inspector's visit, some of the Standard I. class read from *The Daily Telegraph* for him, at my request, not his—I must hasten to say, not to show off "infant prodigies," but to test the method.

It would take up too much spare time to describe it fully; but I may briefly say we take the long vowel sounds first, and the children are taught to build up words with them, and are not introduced to short sounds until they have acquired the power to combine letters into words. When the child first begins to learn to read, confusion in his mind is thus avoided when the different sounds of the same symbol are attempted. Children under five do not read at all, and those of six years do not often have a book, but all the work is done on the blackboard with coloured chalks. The method is a slow one, but the children find it very attractive, and really seem to enjoy their reading lesson as well as any other during the day, because it is made interesting, pleasant, and as logical as the language will admit, and as much of the "play" idea is always introduced as far as possible in this

as in every other lesson. After this mental effort recreation in the playground follows for fifteen minutes, when free play is encouraged, and is vigorously indulged in.

At the sound of the bell the children promptly assemble in the playground in lines, or at once in the hall. Sometimes a few minutes are spent by the children in listening to some descriptive music, after which they march to music back to their classrooms.

Number is now taken throughout, as being the right time, after exercise in the open air. Number is always taught with objects such as shells, acorns, sticks, etc., each child being provided with sufficient quantity, generally placed in a discarded tobacco-box coaxed from "daddy."

In the lower classes, pictures of numbers, and various arrangements of same, are employed, rather than mere counting.

Scheme "B" is taught in the Standard I. class.

An action song or game, or asking riddles, gives relief, and affords scope for physical movement, which the child-nature craves and needs after sitting still.

Writing, as not calling forth so much mental effort on the child's part, ends the morning session. In connection with this exercise, I may say that slates are gradually being discarded and paper substituted, as slates are considered insanitary, and encouragers of bad physical and moral habits.

The afternoon session commences in the same way as the morning, with the omission of prayers, by the children assembling in the hall, and with a few short, quick movements forming into classes and marching to the various rooms, when, after roll-call, a few physical movements are practised, as in the morning, but for a shorter time.

The work of the afternoon is devised so that it shall not call forth so much mental strain as that of the morning, and shall partake more of the manual.

The object lessons are taken from objects with which the children come in contact in their daily life; and, wherever possible, each child is provided with a specimen of the object to be observed, and the children are encouraged to state freely the results of their observation, opinions, and experiences, and, above all, to ask questions concerning the same. Thus we try to make all our object lessons real observation, language, and conversation lessons. If time and space permit, I may have more to say about the observation lessons later.

In the babies' room and upwards we make a special provision on our time-table for sense training; for though, of course, some "sense training" goes on every minute of the day, yet I think it desirable that special attention should be directed to each "sense" separately, so that each sense shall have a chance of asserting its own importance at stated times, for our guide tells us that "accurate and well-cultivated senses lead to accurate perception and comparison, and thus the elements of just thought are prepared."

Therefore, too much stress cannot be laid on this most important factor in the harmonious development of the child. Our children find great fun and enjoyment in detecting what an object is, either with the sense of touch, taste, smell, sight, or sound, or sometimes by using several of the senses; for example, an apple gives scope for exercise of four senses.

On another page I have set out a general and rough description of our usual mode of procedure for carrying out this object.

Now I come to what is generally considered a special feature of our school, and that is "nature work." This is interpreted differently by different people. I hope all our work is "nature work;" but the special department of it, for which so many people come to see us, is that connected with the drawing, painting, and modelling from the natural object, as distinct from following any of those occupations with examples from the artificial or "flat." In anything further I have to say about these, please keep in mind that "accurate and well-cultivated senses lead to accurate perception and comparison."

In this I truly find Froebel "guide, philosopher, and friend," for in his *Education of Man* he says: "The Spirit of God rests in nature, lives and reigns in nature, is expressed in nature, is communicated by nature, is developed and cultivated in nature; yet nature is not the body of God. The undeveloped, maturing human being should profit by the development of maturer men. How much more then should we endeavour to know nature, the work of God; to acquaint ourselves with the objects of nature in their life, their significance, in their relation to the Spirit of God."

Again: "Man sees in nature not only general principles, as has been previously indicated, but he beholds therein his aspiration, his destiny, his mission. Following these silent, absolutely reliable, outwardly intelligent, impersonal teachers, man may not only learn from them with certainty the thing to be done at every moment of his life, but, acting accordingly, he will surely satisfy the demands made upon him.

"Among all objects of nature, none seem in this respect truer, clearer, more complete, and yet simpler—because of their calm, thoughtful aspect, and the clear unfolding of their inner life—than plants, especially trees.....Nothing, perhaps, unites teachers and pupils so intimately as the thoughtful study of nature and the objects of nature..... Therefore it is so important that boys and adults should go into the fields and forests together, striving to receive into their hearts and minds the life and spirit of nature, which would soon put an end to the idle, useless, and indolent loafing of so many boys."

Much more could be quoted to show what stress Froebel lays on nature study as the great aid in child development, but a few words as to our aim in nature study may tend to make the practical part clearer.

By its means we aim at the following:—

1. To awaken and develop the "seeing power."
2. To awaken and develop love of the beautiful.
3. As a means of teaching drawing.
4. Form and colour are taught by it; colour sense developed and strengthened.
5. Truthfulness and accuracy are fostered.
6. Manipulative skill is developed.
7. Independence of action is fostered, as the child does not merely copy the teacher's work.
8. Reasoning power, memory, and judgment are all exercised in the mixing of the colours.
9. Pleasure in the actual doing of work is engendered.
10. A great aid to discipline in a large class, as the children, when well and pleasurably employed, do not try to find unlawful (in the eyes of the grant assessor) outlets for their natural craving of activity.

But some people urge, You are trying to make all the children artists, and that surely is wrong; we cannot all be artists.

I tell these objectors we are no more trying to make them all artists than we are trying to make them all scientists or machinists, but we are trying to foster all-round development. For in proportion to the age of the children, we devote—as our list of object lessons will show—as much time to science in an infant school; and I do not know why we may not use the term in the same sense as we do art—terms mean so much or so little according to the interpreter.

Colonel Parker, in his *Talks on Pedagogics*, says: "There is never a day in a useful man's life when the skill, taste, and initial power acquired by one or all of these modes (gesture, language, or art) is not called into a practical use. There is no trade, business, or profession in which the mental or physical results of art, skill, or study do not essentially and practically assist."

Different kinds of food are required for the nurture and growth of different kinds of physical natures; so art may, in some instances, be the only way of reaching and developing some children's minds.

Again, to quote Froebel, "Its intention will not be to make each pupil an artist in some one or all of the arts, but to secure to each human being full and all-sided development."

A great deal more could be stated in favour of nature study as against some of the more mechanical occupations practised in elementary infants' schools, but space does not admit of it. In my concluding paper next month I will deal with the practical carrying out of nature study.

OUR TUTORIAL SECTION

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Principal of the Belvedere Pupil Teachers' Centre, First on Scholarship List, Author of "Scholarship School Management," "Building of the British Empire," etc.

SPRING EXAMINATION, 1901.

Seventh Month—November.

WORK TO BE PREPARED.

1. READING AND RECITATION.

THESE subjects must not be neglected. Regular oral practice is always essential.

2. ENGLISH.

Candidates.—*Marmion*, Canto vi., lines 681-797.
First Year.—*The Traveller*, lines 297-334. Twenty roots and meanings each week. Derivation of all important words in the passage set for preparation.
Second Year.—*Julius Cæsar*, Act iii., Scene 3, to Act iv., Scene 3, line 120—"and leave you so.' (*Notes*, see below.)

3. ESSAYS.

Write one or two essays each week, selecting from the following:—*Description of any Ruin; Wages—why some men receive more than others; The Habits and Mode of Life of any Wild Animal; The Coast of England; Difficulties a Pupil Teacher meets with; The Changes brought about by the Norman Conquest; Football; Your Favourite Recreation.*

4. HISTORY.

Candidates.—James I. to the Restoration.
First Year.—The Wars of the Roses to 1485.
Second Year.—George I. and George II. (See *Notes* below.)

5. GEOGRAPHY.

Candidates.—The physical features of Scotland, climate, and productions.
First Year.—Siberia, China, Japan, and the Malay Peninsula.
Second Year.—The United States and Central America.

6. ARITHMETIC.

Candidates.—Problems in fractions and decimals.
First Year.—Percentages.
Second Year.—Square and cube root.

7. EUCLID.

First Year.—Props. 21-24, and four deductions per week.
Second Year.—Revise Props. 7-12, with eight deductions each week.

8. ALGEBRA.

First Year.—G.C.M. and L.C.M.
Second Year.—Quadratic equations.

9. MUSIC.

Work a set of questions weekly, and take regular exercise in practical work.

Notes on the Month's Work.

1. ENGLISH.

For full notes, see November Number, 1899.
Pay particular attention to composition. Reading good books and continual practice are the only means by which the subject can be improved. Send up an essay occasionally for criticism. Above all, do not neglect essay writing.

2. HISTORY.

Candidates.—The Stuart period is one in which the great struggle for supremacy between King and Parliament came to a head. It is very necessary, therefore, for the candidate to trace very carefully the gradual growth in the power of the Commons from 1265. Note also the impetus which the Reformation gave to the movement. As men had thrown off the domination of the Pope in spiritual affairs, so they (Presbyterians and Independents) endeavour to curb the power of the Crown. The chief points to be noticed are:—

James the First. The various plots against him. The Hampton Court Conference, and the Authorised Version of the Bible. The rise in power of the Puritans. The quarrels with Parliament.

Charles the Second had more determination than his father. The Three Parliaments, and the Petition of Right. Eleven years of absolute rule, during which period money was raised illegally. The ill-advised attempt to force a Liturgy on the Scotch Church led to the calling of the Long Parliament and a demand for money. Note Hampden's objection to pay *ship-money*—not because of the amount, nor because it was a war tax levied in time of peace, but because it was *illegal*. Prepare a table of the battles in the Civil War, the names of commanders, and the result. Draw a map of England, and put in the various places where battles were fought.

The Commonwealth. Cromwell's personality preserved this form of government. His spirited foreign policy raised England to a foremost position among the nations of Europe. When he died, there was no one to hold the power and control the army, hence Charles the Second was invited to return. It must also be remembered that, although the majority of Englishmen wished for a juster form of government than that of Charles the First, only a part of them fought against him, and only a small section of these (the Independents) were responsible for his execution.

First Year.—The various battles, leaders, and results should be tabulated and learned. The results of this contest are very important:—(*a*) the Feudal System was practically destroyed; (*b*) the king was left nearly absolute, for the Commons were not yet strong enough to oppose him effectively; (*c*) a new era commenced, in which diplomacy took the place of physical force. A life of Warwick should be learned.

Second Year.—George the First. Whig party in power. The Riot Act. The Rebellion of 1715, and consequent passing of the Septennial Act, lengthening the duration of Parliament from three to seven years. The South Sea Bubble, and Walpole's remedies. Wood's Halfpence, and the Drapier Letters. Note that the South Sea Company was by no means an impossible venture. The utter failure was due (1) to paying the government too high a price for the concession of the monopoly of trade; (2) to raising more capital than there was any prospect of paying interest on; and (3) to lavish waste of money and very bad management.

George the Second. Walpole's administration—peace and prosperity. His Excise scheme. War with Spain. The Pragmatic Sanction, and the War of the Austrian Succession. The rebellion of '45—an attempt on the part of the French to complicate matters for us at home, and so prevent any spirited action against them on the Continent. Reform of the calendar. The Seven Years' War. Affairs in India: Clive at Plassey, Eyre Coote at Wandewash. Affairs in America: Wolfe and the capture of Quebec. 1759 is spoken of as the "most glorious year that England has ever seen." Why? Prepare a list of victories. The results of this war were vast: our Indian Empire was founded, and America passed from the hands of France—the earliest colonisers—to England.

3. GEOGRAPHY.

Candidates.—Draw maps of the outline till thoroughly known. Continual repetition is the only way to impress facts and places on the memory.

First Year.—Note Russian extension of recent years in Turkestan and the Pamirs, the Trans-Siberian Railway, Russian policy in China. China is now absorbing much attention, and should receive special notice. (See note under Scholarship Course.) Japan forms a striking contrast to China, having adopted Western ideas with great success.

The Trans-Siberian Railway.

Russia has always experienced a difficulty in its commerce by not having a port on one of the great oceans. The ports on the Arctic are frozen for a large part of the year, those on the Baltic can only be reached through the narrow Sound, and those on the Black Sea could easily be blocked from Constantinople. Notwithstanding continual effort, the empire has not yet reached the Persian Gulf, and it is only in the extreme east of Siberia that an absolutely open port can be obtained. But a port there could only be useful if connected with Moscow and St. Petersburg by rail. Hence the project of the Trans-Siberian Railway, which was commenced in 1891, to connect Vladivostock with the Russo-Siberian frontier.

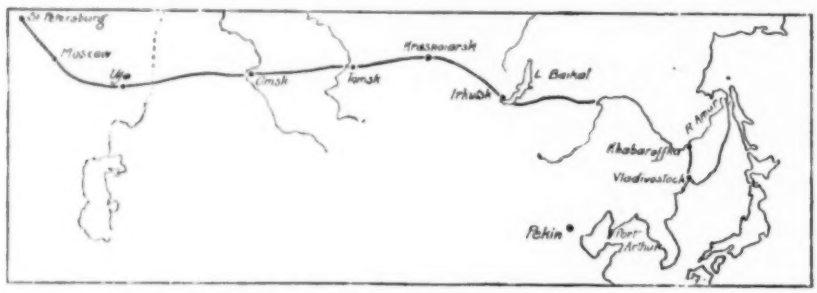
Starting from St. Petersburg, the route is through Moscow, Ufa, Omsk, Tomsk, Krasnoiarsk, Irkutsk, to Baranchiki, on Lake Baikal (3,830 miles). At Baranchiki the train is taken on board a specially constructed steamer, the *Baikal*, made in England, and built on the shores of the lake. It is constructed to carry three trains at once—a passenger train in the centre, and a goods train on either side. It is fitted with a powerful screw at the bow which will break through two or three feet of ice. Trains will be conducted across the lake to Misovaya, a distance of forty-three miles, and from that place they will resume their land journey to Stretensk, on the river Shilka. Steamers will then convey both goods and passengers down to Khabaroffka, on the Amur. A line is already working between this place and Vladivostock (500 miles).

An extension will probably be made to Port Arthur and Talienwan.

The line has cost Russia many millions sterling, and it is doubtful whether it will be a financial success. The rails are light, and are merely spiked instead of being bolted; the embankments are frequently made of sand, which blows away in a heavy wind; and "trains run off the line like squirrels." The rate is only about fourteen miles per hour. Unless a heavy charge is made for

passengers, it will not pay; and if a heavy charge is made, very few will travel. Tea and silk are perhaps the only commodities that would pay their way for transit from east to west.

That it will assist in the development of Siberia is certain, and that it will be used for military purposes in the Far East is also certain.



Second Year.—The United States is set for special study, and hence requires particular attention. Sketch-maps must be drawn and learned. The ordinary text-book can be supplemented by geographical readers on the States. Prepare answers to the following questions (write if there is any difficulty):—

1. Describe, with a sketch-map, the river system.
2. Draw a map to illustrate the main lines of railways.
3. What are the chief imports and exports, and from what ports do they come and go?
4. What is a state? a territory? What is meant by the "District of Columbia"?
5. Give a complete account of the United States Government.
6. Make a list of the twenty chief towns, and mention any reasons why some of them have increased rapidly in size.
7. What is a "blizzard"? How do you account for the sudden and destructive storms which occur?
8. What and where are the Yellowstone National Park, Alkali Plains, Salt Lake, Bluegrass State, Yosemite Valley, Golden Gates, Levées?
9. Give a description of a visit to New York.
10. What is meant by the "Monroe Doctrine"? What are the foreign possessions of the United States?

4. Arithmetic.

Candidates.—Any good text-book will supply a good selection of problems on fractions.

The problems set in the examination require careful thought, and demand some intelligence in solution. A favourite form of question is, "If a man gives away $\frac{1}{3}$ of his money, then $\frac{2}{3}$ of the remainder, then $\frac{1}{4}$ of what then remains, and has 15s. left, what had he at first?"

These sums may be worked in two ways:—

(*a*) Let his original amount be 1.

1. If he gives away $\frac{1}{3}$, he has $\frac{2}{3}$ left.
2. He then gives away $\frac{2}{3}$ of $\frac{2}{3}$, and has $\frac{1}{3}$ of $\frac{2}{3}$ or $\frac{1}{3}$ left.
3. He then gives away $\frac{1}{4}$ of $\frac{1}{3}$, and has $\frac{3}{4}$ of $\frac{1}{3}$ or $\frac{3}{12}$ left.

$\frac{3}{12}$ of the money = 15s.
$\frac{1}{12}$ of the money = 5s.
$\frac{12}{12}$ of the money = 80s.

Or (*b*), working backwards from the result,—

1. 15s. is $\frac{3}{4}$ of the last amount, ∴ the total was 20s.
2. 20s. is $\frac{2}{3}$ of the next amount, ∴ the total was 60s.
3. 60s. is $\frac{3}{4}$ of the original amount, ∴ the total was 80s.

The last method is preferable where anything beyond fractions is introduced. For example, A woman gave away $\frac{1}{3}$ of a number of eggs *and 1*, then $\frac{1}{2}$ of the remainder, then $\frac{1}{4}$ of what then remained, and had 15 left: how many had she at first?

Reasoning backwards,—

1. She had 15 left after giving away $\frac{1}{4}$, ∴ she had 30 before.
2. 30 remained after giving away $\frac{1}{2}$, ∴ 30 = $\frac{1}{2}$ of second number which = 45.
3. 45 is $\frac{2}{3}$ of the original number all but one.

∴ 46 is $\frac{3}{3}$ of the original number, which is **69.**

First Year.—Sums dealing with percentage must in all cases be stated and worked by method of unity. In nearly all cases the cost price should be taken as 100. In a case like the following, A sells a horse to gain 20 per cent. to B, B sells to C to gain 25 per cent., C sells to D for £82, 10s. and gains 10 per cent. What did the horse cost A? It is wrong to say the total gain is 55 per cent.

Let cost price to A = 100. Then he sells to B for £120; B sells for £120 + 20 per cent. of £120 = £150 (not £140); C sells for £150 + 10 per cent. of £150 = £165. Then state thus:—

Original cost of 165 = 100.

" " " 1 = $\frac{100}{165}$.

" " £82, 10s. = $\frac{100 \times £82, 10s.}{165}$ = £50.

If any sum which cannot be worked is met with, it should be sent up for solution.

5. Algebra.

The G.C.M and L.C.M. must be worked by *factors.*

6. Teaching.

All pupil teachers should take regular practice in writing on a blackboard, as prescribed in the syllabus. (Use *Practical Teacher Copy Book* for models.)

Test Questions.

1. *Penmanship.*

Large Hand:—*Undenominational.*

Small Hand:—*We are such stuff as dreams are made of.*

2. *English.—Candidates.*

Analyse the following, and parse the words in italics:—

" 'Stint in thy prate,' quoth Blount, '*thou'dst best*,
And listen to our lord's *behest*.'
And *not* a *moment* will he *bide*
Till squire or groom before him *ride*."

First Year.

Paraphrase lines 255–266, *The Traveller.*

Analyse lines 277–280.

Parse:—" Till, seeming blest, they grow to what they seem."

Second Year.

Paraphrase:—

" Good friends, sweet friends.....
.....to rise and mutiny."

Analyse:—" I am no orator.....
.....which you yourselves do know."

Parse:—" And none so poor to do him reverence."

3. *History.—Candidates.*

(*a*) By what means did Henry the Seventh raise money?
(*b*) Say what you can of the Reformation in England.
(*c*) Write a life of Mary Queen of Scots.

First Year.

(*a*) What revolts were there in Henry the Fourth's reign?
(*b*) Give an account of Henry the Fifth's campaign in France.
(*c*) How do you account for the loss of the French provinces in the reign of Henry the Sixth?

Second Year.

(*a*) What was the main object of William the Third's foreign policy?
(*b*) Give the causes and results of the War of the Spanish Succession.
(*c*) Say what you can of the social life in the reign of Queen Anne.

4. *Geography.—Candidates.*

(*a*) Give as full an account as you can of the physical features of Wales. Draw a sketch-map to illustrate them.
(*b*) What do you know of Cardiff, Penryn, Lake Bala, Welshpool, Llandaff, and Anglesey?

First Year.

(*a*) Describe, with a sketch-map, the mountain system of Asia.
(*b*) Give an account of the chief vegetable productions of (1) Siberia, (2) India.

Second Year.

(*a*) Describe a journey by the Canadian Pacific Railway.
(*b*) What do you understand by the term "Dominion of Canada"? How is it governed? Give a complete list of the provinces and territories, with their chief towns.

AUTUMN EXAMINATION, 1901.

First Month.

The work prescribed is the same as last year, with the exception of the special periods of history. First year pupil teachers have to prepare the reign of Edward the First, and second year pupil teachers "from 1756 to 1783." Special notes on these periods will be given in these columns. The English books have been treated fully in former numbers. Unless many requests are received to renew the notes on parsing, analysis, and paraphrase, they will be omitted; but pupil teachers are at all times invited to send up for criticism specimens of their work, or to ask for explanations of difficulties met with.

All students should be particularly careful with their note-books. In them should be entered analyses, tables, notes (including those given in these columns)—everything, in fact, which should be committed to memory. When revising any subject, the notebook should be quite sufficient without the text-book.

Above all, the work set month by month must be *thoroughly* done. Steady, persevering work always pays better than a rush immediately before the examination.

WORK TO BE PREPARED.

1. REPETITION.

Ten or twelve lines of the passage selected should be committed to memory each month, and, in addition, any lines which are deserving of special note. Candidates and first year pupil teachers would do well to commit the whole of the poems to memory. The following passages are recommended:—

Candidates.—*Marmion*, lines 735–870—

"Blount and Fitz-Eustace rested still.

. . . . .

Good-night to Marmion."

First Year.—*The Traveller.* Start at line 50.

Second Year.—*Julius Cæsar*, Act i., Scene 2, commencing, "Will you go see the order of the course?" or, Act iii., Scene 2, Mark Antony's oration; or, Act iv., Scene 3, Quarrel of Brutus and Cassius.

2. ENGLISH.

Candidates.—Before commencing the study of Canto vi. in detail, it is absolutely necessary to read up a clear account of the preceding cantos; or, better still, to read the whole of the poem. Without some such preparation it is impossible to understand intelligently the contents of this canto. Prepares lines 1–130.

First Year.—*The Traveller.* Prepare lines 1–50. Learn the meanings of all allusions and the derivation of the chief words.

Second Year.—*Julius Cæsar.* Prepare Act i., Scenes 1 and 2, to line 214, concluding—

"And tell me truly what thou thinkst of him."

(Second year pupil teachers will be sure to find difficulties in this play. If they will send them to me, they shall be answered either in the course or by letter.)

Essay Writing.

To ask a pupil teacher to write an essay on any given subject is a good means of testing the amount of reading, composition, and general literary ability. The two chief points necessary to produce a good essay are (1) an abundant knowledge of the subject, and (2) the ability to arrange the knowledge in coherent and logical form and express it in good English. This means plenty of reading and practice. Numerous rules may be given, but they are of less value than "essays" or attempts. An essay must be written each week. Send one up occasionally for criticism.

Subjects:—Spring Flowers; Domestic Animals; A Country Walk; An Old Farmhouse; Your Native Place.

3. HISTORY.

Candidates.—Candidates are advised not to attempt to prepare their history from too large a book. It is much better to know one of limited scope thoroughly than to have an imperfect and confused acquaintance with a large book. The *Outlines* (published by Macmillan) is the best book for the work. Prepare from the Roman Invasion to the Norman Conquest.

Chief Points:—Cæsar's invasions; the Britons—character and religion; Boadicea; Julius Agricola; results of Roman occupation; the Anglo-Saxons—who they were, where they came from, and where they settled; the struggle between the kingdoms: at first nine, afterwards three—Mercia, Wessex, Northumbria; the Danish invasions; Alfred and his work; Dunstan and the church; Saxon manners, institutions, etc.

First Year.—*Alfred to 1066.*

Chief Points:—The defeat and settlement of the Danes; Treaty of Wedmore; Alfred's reforms—army, finance, law, education; the founding of the navy (the year 1901 will be Alfred's *millennium*, and the reign should therefore receive particular attention); the third Danish invasion; the Danish kings; Edward the Confessor—his connection with Normandy, the manner in which his reign paved the way for the Norman Conquest; Godwin and his sons; Saxon life and institutions.

Second Year.—*James the First.*

Chief Points:—The descent of the Stuarts (including Arabella Stuart and the Seymours), their right to the throne; the Millenary Petition and the Hampton Court Conference; the Authorised Version of the Bible; the growth of the Puritans as a religious and political party; the Stuart theory of the Divine Right of Kings; passive obedience; the Dispensing Power; the quarrels with the Commons; impeachment of Bacon; the Plantation of Ulster; James's character and favourites.

4. GEOGRAPHY.

Candidates.—Chief physical features of the globe.

First Year.—Europe generally; position, extent, physical features, climate, productions, and peoples. The more thoroughly this is done, the less work will have to be done when taking each country in detail.

Second Year.—Africa generally and the northern states—Morocco, Algeria, Tunis, Tripoli, and Egypt. The British occupation of Egypt must be noticed.

Sketch-maps must be drawn in all cases, those details inserted which are needed, and the maps practised till thoroughly known. This is the only way to prepare geography properly.

5. ARITHMETIC.

Candidates.—Simple practice, with theory of aliquot parts.

First Year.—Vulgar fractions. Theory and definitions of the various kinds of fractions. Addition, subtraction, multiplication, and division. Complex and compound fractions.

Second Year.—Compound interest.

6. EUCLID AND ALGEBRA.

First Year.—Euclid: Definitions, axioms, and postulates.

Algebra: Meaning of terms; substitution of numerical values.

Second Year.—Euclid: Props. 26–30, with four deductions per week.

Algebra: G.C.M. Work as far as possible by means of factors.

7. MUSIC.

Candidates.—The common major scale, its structure and intervals.

First Year.—First removes of key.

Second Year.—The minor scale, its structure and relation to the major.

8. TEACHING.

Practise writing on the blackboard, *after* writing the same letters in the copy book. (Use the *Practical Teacher Copy Book*—the only book specially prepared for pupil teachers, with full rules and instructions.)

(*No Test Questions will be set this month.*)

SCHOLARSHIP EXAMINATION, 1900.

Eleventh Month—November.

WORK TO BE PREPARED.

1. *Penmanship.*—A few minutes' daily practice from the *Practical Teacher Copy Book.*

2. *Theory of Teaching.*—Chaps. xiv. and xv., *Scholarship School Management.*

3. *Geography.*

(*a*) Revise South America.
(*b*) Revise England thoroughly.

4. *History.*—The history of the Colonies (use *The Building of the British Empire*, Holden), and revise general history up to 1714.

5. *Composition.*—One or two essays each week, on such subjects as:—

(*a*) The development of the Empire during the present reign.
(*b*) A general election.
(*c*) The trade of the West Indies.
(*d*) Advances during the present reign.
(*e*) The Penny Post.
(*f*) Affairs in China.
(*g*) "Hope springs eternal in the human breast."

6. *English.*

(1.) Twenty roots and meanings each week.
(2.) Revise the history of the language from 1485 to the present time.
(3.) Revise the first half of *Julius Cæsar.*

7. *Arithmetic.*—Work through the miscellaneous problems, Exercise 118, Christian and Collar.

8. *Algebra.*—Revise proofs of all the rules, and be able to show how any formula is obtained—for example, if $ax^2 + bx + c = 0$,

then $$x = \frac{-b \pm \sqrt{a^2 - 4ac}}{2}, \text{ etc.}$$

9. *Euclid.*—Revise the second half of Book I., with as many deductions as possible per week.

10. *Elementary Science.*—Start revision of the subject. (See questions given last month on Section 1.)

11. *Languages.*

Latin—*Pliny's Letters*, Nos. 11 and 12. Exercises in unseens and in composition.

French—*Le Trésor*, next three pages. Exercises in unseens and in composition.

12. *Drawing.*—A freehand copy each week, and exercises in geometry.

13. *Music.*—Chap. xi., *School Music Teacher.*

14. *Domestic Economy.*—Revise rules for preserving health. The management of a sick-room.

Notes on the Work for the Month.

1. Geography.

(See note above on the Siberian Railway.)

The following questions will help in the revision of England. They are typical questions selected from examination papers:—

1. Give an account of the physical features, industries, and places of interest to travellers in one of the following counties:—Devon, Warwick, Carnarvon, and Durham.

2. Name the principal industries which have arisen upon the Northumberland, South Lancashire, and Warwickshire coalfields, and point out the natural growth of the causes of those industries.

3. Name the chief bays, capes, river mouths, and seaports between the mouths of the Forth and Thames.

4. State what you know of London under these heads:—(1) position; (2) approximate size and population; (3) supply of food and fuel; (4) commercial and financial importance; (5) access to seaside watering-places.

5. Name the chief seaports of Wales, and briefly explain the importance of each. Name the great railways which connect England and Wales, their London stations, and their great stations in or near Wales.

6. What reasons can be given for the great decline in the lead, copper, and iron mining industries of Wales?

7. Describe the course of the river Severn or Trent, mentioning the tributaries, chief towns, and the counties through which the river flows.

8. Describe as fully as you can the English Lake District.

9. "Wales forms a region which is distinguished from England at once by its geographical position, by the age of its rocks, by the height of its mountains and grandeur of the scenery, and by the origin of the people." Comment on these statements.

10. Say what you know about the Fens, the Downs, the Peak, the Black Country, and the Devonshire Moors.

11. Give some examples of names of English places which indicate a Roman, British, or Danish origin.

12. Give some account of the commerce of England.

(*Next month a complete set of questions on the Colonies will be given.*)

2. History.

The following are recent questions in history:—

1. What causes or principles were defended or represented by the following:—Becket, Simon de Montfort, Oliver Cromwell, Earl of Essex, Algernon Sydney, Wilkes?

2. How are the following places connected with English history:—Runnymede, Towton, Calais, Saratoga, Culloden, Hampton Court, Oxford?

3. What efforts were made in the reigns of Henry II., Edward I., Edward VI., Anne, and George III. to bring the British Isles under one authority, and with what success?

4. Explain four of the following terms:—Feudal Aids, Assize, Cinque Ports, Ministerial Responsibility, Three Estates of the Realm, Monopolies, Star Chamber.

5. Compare Henry II. and Edward I. with regard to—
   (*a*) Extending the dominions of the Crown.
   (*b*) The administration of justice.
   (*c*) Relations with the clergy.

6. What were the points of difference—(*a*) between Charles I. and Parliament; (*b*) between Cromwell and Parliament? Give reasons to account for the facts—(*a*) that Cromwell was able to maintain his power; (*b*) that the Protectorate could not be maintained after his death.

7. In what ways did James II. act unconstitutionally? What safeguards against like action on the part of the sovereign were provided on the accession of William and Mary? What further conditions were laid down before the accession of the House of Hanover?

8. State briefly, with dates if you can, some facts of historical importance in connection with Monasteries, Universities, the Poor Laws, the National Debt, the Bank of England, the East India Company, Negro Slavery.

9. State briefly of each of the following—(*a*) when he lived; (*b*) with what political or social questions his name is associated:—Milton, Locke, Hume, Clarendon, Burnet, Burke, Cobden, Dr. Arnold, Howard.

10. Briefly state the immediate issue of the battles of Bouvines, Naseby, Malplaquet, Fontenoy, and of the Siege of Orleans. What results of a permanent character may be traced to any of these battles?

11. Explain the objects of the Habeas Corpus Act, the Mutiny Bill, Poyning's Law.

12. What great religious movements originated in the reigns of Edward III., Elizabeth, and George II.? Show in each case how far the state of the time will account for the origin of these movements.

13. To what causes do you mainly attribute the failure of the Stuarts to win back the English Crown—(*a*) in 1715, (*b*) in 1745?

14. How was the union of England and Scotland accomplished? What were the chief provisions of the Act effecting it?

15. Describe the policy of the Norman kings with regard to Wales.

16. Describe some of the consequences of the Norman invasion.

17. What caused the Wars of the Roses, and what were some of their results?

18. What reasons may be alleged to justify Queen Elizabeth's treatment of Mary Queen of Scots?

19. What were the chief causes which led to the Revolution of 1688?

20. How did the foreign policy of William III. affect his treatment of English political parties?

(*To be continued.*)

3. Composition.

The following notes have been asked for on topics likely to be set for an essay:—

Affairs in China.

To understand the position of China at the present day, and its general attitude towards the nations of Europe, it is necessary to take into consideration the unique position which it occupies. Nearly all land communication is cut off by the chains of mountains which everywhere separate it from neighbouring countries; the sea voyage, before the era of steam, was long and tedious. The land is rich in minerals, is extremely fertile, and produces everything which a nation requires. Hence China has remained isolated and self-sufficient.

The first foreigners who settled here and there in its ports were tolerated—were looked upon with an amused contempt, as ignorant barbarians who had come to share in the wealth of the Celestial Empire. When opposition to their methods and objects of trade occurred, the Chinese discovered that somewhere these merchants had a great power behind them, and war ensued. When the storm cleared, Canton, Amoy, Foochoo, Ningpo, and Shanghai were open ports, and Hong Kong had been ceded to England. In twenty years' time another war broke out, and thirteen more ports were forcibly opened.

Henceforward foreigners were looked upon with suspicion as the forerunners of trouble and loss of territory. The opium trade, which England, to her disgrace, had forced upon the country, was another cause of resentment. To foster the revenues of India, we insisted upon the Chinese admitting a drug which has ruined hundreds of thousands of people, and which, in spite of the efforts of the Government, is still doing its fell work.

The war with France led to the loss of Tonquin, the war with Japan to a heavy indemnity and the loss of Formosa.

The European Powers proceeded to rob China in a more open fashion. Russia seized Port Arthur, the Germans Kiaochow, the French Lungchow, and the English "leased" (a euphemism for "stole") Wei-hai-wei. It became a common thing for Western papers to detail schemes for the dismemberment of China, and to share it amongst the Great Powers. These articles were translated and read by many educated Chinamen.

Notwithstanding all these proceedings, there were a party of reformers in the country who were anxious to see the people profit by Western methods and inventions. After the war with Japan, they strenuously endeavoured to introduce up-to-date ideas; and as the Emperor was only a lad, they to some extent succeeded. Then came the *coup d'état* of 1898. The anti-foreigners, with the Dowager Empress at their head, deposed the Emperor, executed six of the leading reformers, and banished and disgraced others. Their policy received the approbation of all conservative Chinese, and an era of persecution commenced. The Boxers—a religious brotherhood—began to annoy and attack native Christians and missionaries. The latter were unpopular, not so much on account of the religion they taught, as because they interfered in matters—lawsuits, etc.—which were really outside their special work. It was also generally suspected that missionaries of all kinds were political agents, spying out the land, and advising their nations of the weakness and strength of the Chinese nation.

The attacks on native converts and all Europeans received the tacit approval, if not the active support, of the Dowager Empress and the anti-foreign ministers, especially Prince Tuan, Kang Yi, and Hsu Tung. Matters came to a crisis with the murder of the German minister and the besieging of the other ministers in the British Legation. Admiral Seymour endeavoured unsuccessfully to relieve them, and it was not till a united force of English, Americans, Japanese, Russians, and French had cut their way to Pekin that the fate of the various ministers was known. The Empress and Court fled. The troops marched through the Forbidden City, and sacked some of the palaces.

At the time of writing, the Powers have not decided what punishment shall be inflicted, but there is a great possibility that the ringleaders in the attack on the Embassy will be handed over for punishment, the Empress dissociated from all share in the government, and some regular form of government instituted. A garrison will be left in Pekin, and the road thither from the sea kept open.

The Transvaal War.

The chief events and dates are as follows:—

1899.

Oct. 8. Transvaal ultimatum sent. War commenced on the 11th.
Oct. 20. Battle of Dundee. Boers defeated, with a loss of four guns.
Oct. 21. Battle of Elands Laagte. Boers defeated. Two guns captured. Concentration in Ladysmith.
Oct. 30. Disaster of Nicholson's Nek.
Nov. 15. Wreck of the armoured train near Chievely.
Nov. 23. Battle of Belmont. Boers defeated heavily by Methuen's force.
Nov. 25. Battle of Gras Pan. Boers defeated heavily by Methuen's force.
Dec. 10. Gatacre made his unsuccessful attempt on the Stormberg.
Dec. 11. Battle of Magersfontein. British repulsed with heavy loss.
Dec. 16. Lord Roberts appointed Commander-in-Chief, with Kitchener as Chief of Staff.

1900.

Jan. 6. Heavy attack on Ladysmith.
Jan. 23. Spion Kop occupied by Warren; abandoned the following day.
Feb. 15. Roberts outflanked the Boers at Magersfontein. French *relieved Kimberley.*
Feb. 18. Cronje surrounded at Paardeburg.
Feb. 27. Cronje's surrender.
Feb. 28. *Ladysmith relieved.*
Mar. 1–13. Roberts's forward march to Bloemfontein. The Boers outmanœuvred at every position.
Mar. 13. Bloemfontein occupied.
April Southern part of Free State reduced by French, Hamilton, and Brabant.
May 2. Brandfort occupied.
May 17. *Mafeking relieved.*
May 27. Roberts crosses the Vaal.
May 28. Free State annexed as the *Orange River Colony.*
May 31. Roberts entered Johannesburg. Flight of President Kruger.
June 5. *Pretoria occupied.*
July 7. Buller, who for the past two months had been clearing Natal, reached Pretoria.
July 17. Plot to retake Johannesburg discovered.

July 23. General advance of the army from Pretoria.
July 30. Prinsloo surrenders.
Aug. 28. Buller occupies Machadodorp.
Sept. 1. *Transvaal reannexed.*
Sept. 6. Lydenberg occupied.
Sept. 11. Kruger fled to Lourenco Marques.
Sept. 13. French surprised Barberton.
Sept. 19. War practically over. Roberts reports, "Nothing now left of the Boer army but a few marauding bands."

4. Algebra.

Reasons for the following formulæ and proofs of these rules should be prepared :—

1. If a measures p and q, it measures $mp \pm nq$.
2. The rule for finding G.C.M.
3. The rules for multiplication and division of algebraic fractions.
4. If $ax + bx + c = 0$, $x = \dfrac{-b \pm \sqrt{a^2 - 4ac}}{2a}$.
5. To find the condition that $x^2 + px + q$ may be a perfect square.
6. To prove $a^m + a^n = a^{m+n}$.
7. To prove $a^m \div a^n = a^{m-n}$.
8. To prove $(a^m)^n = a^{mn}$.
9. To prove $a^0 = 1$.
10. If $x + \sqrt{y} = a + \sqrt{b}$, then $x = a$, $y = b$.
11. In arithmetical progression, $s = \frac{n}{2}(a + 2)$,
$l = a + (n - 1)d$,
$s = \frac{n}{2}\{2a + (n - 1)d\}$.

Test Questions (taken from 1899 papers).

1. *Penmanship.*
Large Hand :—*Observatory.*
Small Hand :—*His glowing axle doth allay*
In the steep Atlantic stream.

2. Write notes of a lesson on *one* of the following subjects, and say for what standard or infant class you intend the lesson :—
(*a*) A stream.
(*b*) The diurnal motion of the earth.
(*c*) A pebble.
(*d*) The migration of birds.
(*e*) The foot-rule.

3. Describe as fully as you can the methods used in your school for testing and recording the progress made by children in the different subjects of instruction.

4. What circumstances at home and abroad fostered commerce and the increase of wealth in Elizabeth's reign?

5. (*a*) Multiply 4567 by 73, justifying briefly the process for children who already understand multiplication by a single figure.
(*b*) Answer the following briefly, but so as to show you are not guessing :—
In working the above sum, we write 5 numbers in 5 successive lines. To what multiplication sums do we obtain answers if we separately subtract—
(1) The first number from the 5th?
(2) The 2nd from the 5th?
(3) The 3rd from the apparent 4th?
(4) The 3rd from the real 4th?
(*c*) Illustrate by a diagram, or by the pence table, or by any other means, the fact that $\frac{2}{3}$ of $\frac{3}{4}$ is $\frac{1}{2}$, and prove generally that the value of a fraction is not altered if its numerator and denominator are multiplied by the same integer. Reduce $\frac{5}{12}$ and $\frac{7}{18}$ to fractions with a common *numerator*, and hence show which is the greater.
(*d*) Give a general rule for the division of decimals. Find the remainder when 1 has been divided by ·19 to three places of decimals in the quotient.
(*e*) Define factor, common factor, prime number, and odd number. How many numbers between 1000 and 10000 are exactly divisible by 29?

6. Distinguish, giving examples, between indicative and subjunctive mood, gerund and participle, complex and compound sentences, simile and metaphor.

7. Write a short essay on—A comparison of town and country life (which you prefer, and why).

8. ABC is an equilateral triangle, D any point on the base BC. AD is joined, and on it two equilateral triangles, EAD, FAD, are described, with the points E, F on the same side of AD as B and C respectively. Prove that EB = DC, and FC = DB.

9. What would be the advantages and disadvantages of heating a room in either of the following ways—hot air, hot water, or by means of an open fire?

10. Rewrite the following passage, making a change to the first sharp key by a bridge note at (*a*), and a return to the original key at (*b*) :—

(*a*) (*b*)
s m s d' t f e l s f e s r t l t s m r m f r d

11. In what sense does the geologist use the term *rock?* What do you mean by an aqueous rock? A rock is exposed in the side of a cliff; how can you generally tell whether it is or is not aqueous?

12. Show the truth of the saying that "the sun never sets on the British Empire."

13. A square pond contains 11 circular islands, each 14 feet in diameter. The islands occupy $\frac{2}{3}$ of the area of the square. Find the breadth of the pond. (Assume $\pi = \frac{22}{7}$.)

CORRESPONDENCE: RULES.

To ensure an answer in the next issue, queries must be sent by the 15th of each month.

Name and address of sender, with coupon of current number of The Practical Teacher (and *nom de plume* if desired), must be enclosed.

As a rule, all replies will appear in the Correspondence Column; but any one desiring an immediate reply may obtain it by enclosing a stamped addressed envelope.

All communications and queries with regard to the PUPIL TEACHERS' AND SCHOLARSHIP COURSE should be addressed to "Mr. A. T. Flux, The Bays, Belvedere, Kent."

Answers to Correspondents.

M.S., Chester.—Essay, 50/50. Punctuation needs some attention.

Friendly Leaves.—Essay, 45/50. Subject-matter very good, but not properly divided into sections. Penmanship poor.

Eugene.—The answer to your queries is a decided affirmative in each case. As long as you are a pupil teacher, your head is bound to give you instruction, and the managers are responsible for this being done properly.

Albion.—If a pupil teacher attends a course of university lectures recognised by the Board of Education, and takes the examination at the end of the course, he need not take that subject at the Scholarship Examination, but is credited with the marks obtained in the previous examination. It by no means follows that any pupil teacher will get 125, which is the maximum mark; he may get anything between that and 0. The marks depend, of course, upon the value of the written answers. I forget whether the result was published; I think it was. The prize was awarded, I know.

Worried.—Essay, 40/50. Hardly long enough, and not overwell arranged. The essay should be in paragraphs, each dealing with one phase of the subject. Penmanship, 8/20. Very poor. Get a good copy book without delay, and practise daily.

Latin.—It is impossible to say what book the "unseen" will be taken from. I should think, however, it will be considerably easier than the Letters—possibly a paragraph from Cæsar's *Gallic War*. If you have time, you should read a little of this.

A. T. and others.—Your queries are answered above.

Puzzled.—If you consider for a moment, you must see that "5 cuts" down will divide it into 6 parts, not 5. Similarly, "3 cuts" divide it into 4 parts.

Brighton.—Thank you for your suggestion, which I will endeavour to use on the first possible opportunity.

(*Other correspondents answered by post.*)

Ready Shortly.

CORNELIUS NEPOS:

LIVES OF MILTIADES AND EPAMINONDAS.

Text, Translation, Notes, etc.

With every possible help for

SCHOLARSHIP STUDENTS, 1901.

By C. J. Phillips, M.A.,

Latin Master, Stockwell Pupil Teachers' Centre.

THOS. NELSON AND SONS, 35 and 36 Paternoster Row, London, E.C.

OUR CERTIFICATE COURSE FOR 1901.

BY GEORGE COLLAR, B.A., B.SC.,

Head-Master of the Stockwell Pupil Teachers' School.

TEST QUESTIONS ON LAST MONTH'S WORK.

THEORY OF TEACHING.

1. How would you explain to children the nature of division, so as to enable them later on to overcome the difficulties presented by—

(*a*) The fact that when a quantity is divided by a proper fraction, the quotient is greater than the divisor?

(*b*) The division of one concrete quantity by another?

2. Give a few simple methods by which children may be taught to *prove* their work in arithmetic.

3. How does Leibnitz define knowledge? Give and explain the chief terms he uses in describing the different degrees of knowledge.

ARITHMETIC.

1. Give the denominators of all fractions which will produce pure recurring decimals with three digits in the period.

2. Tell all you can by inspection about the decimals which will be produced by the following vulgar fractions: $\frac{7}{14}$, $\frac{2}{25}$, $\frac{5}{32}$, $\frac{13}{45}$, $\frac{23}{77}$, $\frac{119}{441}$.

ENGLISH GRAMMAR AND LITERATURE.

FIRST YEAR.—1. Give a short account of Campbell's life and works.

2. What historic events led to the production of any of Campbell's poems with which you are familiar?

SECOND YEAR.—1. Give a short account of Macaulay's stay in India.

2. What is the subject of the second book of *Paradise Lost*?

GEOGRAPHY.

BOTH YEARS.—1. Trace the movements of the French armies employed against the Second Coalition.

2. Describe the course of the Rhine *or* of the Danube.

3. What part has been played by glacier action in the development of the present physical features of Europe?

HISTORY.

BOTH YEARS.—1. What internal reforms were carried out under the Consulate?

2. Give a complete account of the attempted conquest of Egypt by the French.

ALGEBRA.

WOMEN—BOTH YEARS.—1. Find the H.C.F. of—

$$4x^4 - 4x^3 + x^2 - 1 \text{ and}$$
$$2x^3 + 5x^2 - 2x + 3.$$

2. Find the factors of the following, and thence deduce their L.C.M.:—

(*a*) $2x^2 + 3x - 2$.
(*b*) $(5x - 7)^2 - (x - 5)^2$.
(*c*) $2x^3 - x^2 - 8x + 4$.

MEN—FIRST YEAR.—1. What relation between a and b will make

$$\frac{3}{x-a} - \frac{2}{x+a} = \frac{x+b}{x^2-a^2}?$$

2. Solve the following equations:—

(i.) $\begin{cases} 3x^2 + 2x + y = 19. \\ 2x^2 - x + 2y = 12. \end{cases}$

(ii.) $\begin{cases} xy = 6. \\ x + y + z = 6. \\ x^2 + y^2 + z^2 = 14. \end{cases}$

MEN—SECOND YEAR.—1. Expand the following expressions:—

(i.) $(3x - 5)^7$. (ii.) $(a^2 - b^2)^6$.

2. Find the value of $(x + 1)^9 + (x - 1)^9$ without expanding each expression separately.

FRENCH.

BOTH YEARS.—1. Write the present indicative and the preterite of *s'en aller*, *ouvrir*, and *dormir*.

2. Translate the following:—

Travaille, sois fort, sois fier, sois indépendant, méprise les petites vexations attribuées à ton age. Reserve ta force de résistance pour des actes et contre des faits qui en vaudront la peine. Ces temps viendront. Si je ne suis plus, pense à moi qui ai souffert et travaillé gaiement. Nous nous ressemblons d'âme et de visage. Je sais dès aujourd'hui quelle sera ta vie intellectuelle. Je crains pour toi bien des douleurs profondes, j'espère pour toi des joies bien pures. Garde en toi le trésor de la bonté. Sache donner sans hésitation, perdre sans regret, acquérir sans lacheté; sache mettre dans ton cœur le bonheur de ceux que tu aimes à la place de celui qui te manquera, garde l'espérance d'une autre vie: c'est là que les mères retrouvent leurs fils.

NOTES AND SYLLABUS FOR NOVEMBER.

ENGLISH COMPOSITION.

Prepare essays on the following subjects:—

1. The study of literature.
2. The blessings of peace.
3. Examinations.

THEORY OF TEACHING.

SECOND YEAR.—Finish the methods of teaching arithmetic.

In the teaching of decimal fractions, it is essential that the notation should be regarded as an extension of the decimal notation of whole numbers; and, indeed, if proper attention has been paid to the place-value of the digits in teaching operations with whole numbers, there will be really nothing fresh to teach in the ordinary school course on decimals. The mechanical teaching still so much in vogue is greatly to be deplored. In fact, many of the "rules" generally followed in decimals are purely mechanical tricks: thus the common plan of multiplying with utter disregard for place-value, and depending on a trick for putting in the point at the last stage, is a very unsound one. It has the merit of enabling a pupil to get a correct answer; but if that were the only object, arithmetic would be of little use as an educational subject. Moreover, the corresponding method of working division is so complicated that pupils are very liable to slips which are seldom made by those who work by the more intelligent method. Attention to place-value also renders the teaching of approximations very simple, and it is a pity that more attention is not paid to this important part of the work.

The rest of the work depends largely upon the right conception of proportion. We should prefer to say that there is no such rule in arithmetic. The sums generally so called are really examples of multiplication by fractions, with a preliminary step determining what is the fractional multiplier.

Logic.—Study carefully Jevons, Lessons x.–xiv. Special attention should be paid to the account of the work of Pascal and Descartes, as the indebtedness of modern methods of education to these two men is very great. The subject is treated in a somewhat different order in Welton, whose remarks on definition and classification will be found in chapter xvi.

ARITHMETIC.

The Metric System.—Study its history and the construction of the tables.

Its advantages are:—

1. Being a decimal system, the operations in it are of precisely the same nature as those in the "Simple Rules;" it is only necessary to mark the principal unit involved.

2. The uniform relation between one unit and the next makes the tables easy to remember.

3. There is a simple connection between one table and another—for example, length and capacity, capacity and weight.

4. It affords an almost universal method of conducting trade with foreign countries.

On the other hand, it may be urged:—

1. That as the only factors of 10 are 2 and 5, the units are not capable of such ready subdivision as is the case with the shilling and foot. This argument tells *for* the system in the case of the *perch* and *yard*.

2. The facility with which computations are made renders the system less suitable as a means of intellectual discipline. It certainly seems as though the average Englishman were quicker at figures than the average inhabitant of a country using the system. This, however, is perhaps merely the result of the greater number of hours which must necessarily be spent in mastering our complicated system; and there need be no loss in the amount of mental discipline supplied by the school course, for much of the time now spent in mastering the present clumsy system might be devoted to algebra or geometry, or some other disciplinary branch of mathematics.

The approximate value of the metric units should be remembered. When an example is set requiring exact calculation, the value of the units is always given.

English Grammar and Literature.

First Year.—Begin the study of the historical grammar of the language. This month take the Saxon element, and prepare the following points in particular:—

1. Reasons for regarding modern English as descended from the so-called Anglo-Saxon.
2. Differences between modern English and Anglo-Saxon.
3. Anglo-Saxon inflections which have survived.

Lyra Heroica, lxxxiv.–cii. Macaulay's well-known poem of Horatius deals with the attempted recovery of the throne by Tarquin, who was expelled from Rome for his misdeeds and those of his son Sextus. Lars Porsena, a neighbouring king, to whose court Tarquin had fled, fitted out an expedition to reinstate his friend.

Massilia's triremes. Massilia, now Marseilles, was a Greek colony in Southern Gaul. Triremes were large boats propelled by three rows of oars on each side, the oars being generally worked by slaves.

Notice the poetical way in which the flocking to the expedition is described: facts are stated, and the reader is left to infer the cause.

Champaign. The country as opposed to the town.

Tarpeian. The Tarpeian Rock was part of the Capitoline Hill, and one of the highest points in Rome.

Fathers of the City—that is, the Senate. The proper number of senators was three hundred, and they were always addressed as Fathers (*Patres*). There was not, however, the full constitutional number at the time of the expulsion of the Tarquins, and the newly-appointed consuls selected men to make up the number. The new senators were thus called *Conscripti*, and the assembled senators were addressed as *Patres et Conscripti;* but soon the distinction between the new and old senators was lost, and the Senate was addressed by speakers as *Patres Conscripti* (or Conscript Fathers).

Janiculum. A fortress built on the right bank of the Tiber by Ancus Marcius.

Notice the fine word-picture illustrating the approach of the army.

Holy Maidens—that is, the Vestal Virgins, six priestesses of the goddess Vesta whose duty it was to maintain the fire by which the goddess was represented in her temple instead of by a statue. Vesta was the goddess of the hearth (*focus*), the centre of every family circle.

Ramnian, Titian. Rome was founded by the fusion of the followers of Romulus, or the Ramnians, supposed to have come from Troy, and the Sabines or Titians. Hence all the aristocratic families of Rome claimed to belong to one of these two old tribes.

Tribunes. These were officers appointed for the protection of the *Plebs*, or common people, from oppression. The houses of the tribunes were kept open continually, so that any one might claim sanctuary there, and obtain the tribune's aid.

Campania's hinds. The peasants dwelling in Campania, the district between Rome and the sea.

lxxxv. *The Armada* needs no historical introduction to our readers.

Semper eadem = always the same. This was the motto of Queen Elizabeth.

War-flame. The news of the approach of the Armada was spread by lighting beacons on the hills.

This poem is only a "fragment;" the writer got no further with it than the account of the way in which the news of the arrival of the Armada was spread. Macaulay soon gave up writing poetry. He does not seem to have had that intense depth of feeling which is the first characteristic of the true poet, and he seems to have been aware of his own inferiority to Byron and others who were coming into favour and fame at the time.

lxxxix. *Scarfed and bolted.* Cut so as to make a joint, which was strengthened by *bolts* or iron rods going through and kept in place by a nut screwed on to the end.

Lascar. An East Indian sailor working in an American or European ship.

Stemson, keelson, and sternson knee. In shipbuilding, a knee is a piece of timber cut at an angle, and is used in joining the ribs to the keel, etc.

Shrouds and stays. Ropes coming from the sides of the ship to the masts to hold them steady.

Shores and spurs. The short, stout pieces of wood that prevented the vessel from falling over while it was being built.

xc. The subject-matter of this poem is found in King Alfred's translation of the *Universal History* of Orosius, a Spanish Christian of the fifth century. The account of the discovery of the North Cape is not to be found in the original, but Alfred wrote it directly from the account given him by Othere himself, and embodied it in the book he was translating.

Lover of Truth. Compare Tennyson's ode on the death of the Duke of Wellington—

> "Truth-teller was our England's Alfred named,
> Truth-lover was our English Duke."

Meres and plains. That is right in Sweden. Norway itself is a plateau.

Sagas. The traditional histories and legends.

Southward through the haze. This is an evident misprint. The midnight sun is seen to the *northward*.

Narwhale. A word of Scandinavian origin, meaning literally "corpse-whale:" the body of the animal tapering at both ends like a whale's, and being of a livid colour like a corpse.

xci. *Kraken.* A sea monster supposed to inhabit the North Atlantic.

Dirge. A funeral psalm. The word is derived from *Dirige* (*Domine, nos*), the first word of the psalm, "O Lord, direct us."

xcii. *Buccaneers.* Pirates. The word is derived from the Caribbean word *boucan*, meaning "sun-dried meat." Buccaneers were originally sellers of dried provisions, then sailors who regarded the Spanish possessions in the New World as lawful objects of attack.

Rembrandt. A Dutch painter who is particularly celebrated for his effective contrasts in light and shade.

Second Year.—Finish *Paradise Lost*, Book II. (See last year's notes in The Practical Teacher for help over difficulties.)

Study Macaulay's *Life and Letters*, chaps. vii.–ix. Note particularly Macaulay's relations to other literary men and politicians after his return from India.

Geography.

Both Years.—In studying the geography of Europe, our next care should be to note the effects of the configuration which we described last month. The ranges of mountains determine the course of the rivers in most cases; and so, generally speaking, the watershed of the country will be found to run along the highest ranges. In tracing the watershed of Europe, however, it is usual to divide the continent into two areas—that drained into the Atlantic and Arctic (including the North Sea and Baltic Sea), and that drained into the Mediterranean (including the Black Sea) and the Caspian Sea. Starting from Tarifa Point, the watershed follows the general course of the Sierra Nevada, Sierra Segura, and Sierra d'Oca to the Cantabrian Mountains at Pena Labra, near the source of the Ebro. It then follows the Cantabrian Mountains to Puigmal in the Pyrenees, to the east of Andorra. It is then continued through the Cevennes and Côte d'Or, which separate the valleys of the Gironde and Loire from that of the Rhone. The part which separates the upper valley of the Seine from that of the Saône is not very elevated, consisting of the plateau of Langres. Passing by the southern peaks of the Vosges to the Jura, and half-way down that range, it is continued by the Bernese Alps, which separate the upper Rhone from the Aar and other tributaries of the Rhine. The next section is rather involved, but it can be traced through part of the Rhætian Alps and the mountains on the north-west side of the Engadine to Fetchell Spitz, and so on through ill-defined high ground close to the northern banks of Lake Constance and the Rhine to the Black Forest and Swabian Alps. This is the most westerly point of the Black Sea basin. We next trace it through the Böhmer Wald and Moravian Mountains, which divide the Elbe valley from the Danube, and then some way along the Carpathians, whence, in order to divide the Baltic from the Black Sea and Caspian basins, we must draw our line, through land often not more than five hundred feet in height, through the Valdai Hills, in which rises the Volga, and across to the Ural Mountains.

In studying the countries in detail, the watershed should be traced in the same way. Next see how the build of the continent affects the political divisions and trade routes. Our readers who have not travelled will have no idea of the vast difference between a mountain chain and a river as a boundary between two countries. A mountain chain seems to entirely separate the people living on its two sides; they have very little communication, and differ frequently in race, in language, and in customs. A river, on the other hand, seems intended as a means of communication and of bringing people together. Although so clearly defined, a river course is a most unsatisfactory political boundary.

Trade Routes.—The sea is one of nature's great highways, and the extensive coast-line of Europe greatly facilitates commerce between different parts of the Continent. We might here refer to the timber trade between the Baltic and Great Britain; the wine trade between Bordeaux, Oporto, Cadiz, and Malaga and London; the exchange of coal and corn between Great Britain and Odessa and other Black Sea ports. The influence of the sea on the trade with places outside Europe is shown by the former prosperity of Genoa, Carthagena, and Venice at the time of the old overland route to India. This was changed by the diversion of the trade round South Africa by the discovery of the Cape of Good Hope, but has lately been restored by the opening of the Suez Canal, to which such ports as Brindisi owe their importance.

In level countries rivers offer great facilities for intercourse, owing to the ease with which goods can be conveyed on them. This gives great importance to the rivers of Russia, which, flowing as they do into landlocked or quasi-landlocked seas, do not put the country into close connection with the outside world.

Where the slope of the country is considerable, the streams are too swift for ascent, and consequently they are useful for trade simply because they bring down the timber which grows near their source. Thus great rafts may be seen coming *down* the Rhine; but the steamers go up no further than Mannheim, and passenger steamers seldom go beyond Mayence.

But although the upper courses of the rivers may not be navigable, they very materially aid commerce on account of the valleys they have worn in the elevated land. Thus in Switzerland the river valleys are the great means of communication, through which pass roads, and in some cases railways. Thus, from the north the railway passes up the valley of the Rhine to Basle, thence to Olten, where it is joined by others; then after passing through Lucerne it ascends the valley of the Reuss, and after passing through the St. Gotthard Tunnel (9½ miles long) it descends the valley of the Ticino, and establishes connection with Italy. Again, the Mont Cenis Tunnel puts the valleys of south-eastern France in connection with those of north-western Italy. So also the valley of the Rhone is traversed by the Jura-Simplon Railway, which is connected through Pontarlier with the railways of France. At present the railway tunnel through the Simplon is not completed, so that from the present terminus at Brieg travellers must take the military road constructed by Napoleon over the Simplon Pass, and descend the valley of the Toccia through Domo d'Ossola to Milan. A careful study of a map, especially if it is a relief map, will show how closely the railways follow the river valleys. The unfortunate feature about Spain is that the rivers generally run in deep gorges, and although there is generally a fairly good road close along by the side, yet it is obliged to follow each little turn of the river, and the difficulty of cutting cross-roads is very great.

The importance of river mouths as harbours must be noted. A river mouth not only affords the same shelter for shipping as a small bay, but is also in ready communication with the interior. Make a list of the chief European ports which are situated at the mouths of rivers.

Special Geography.—Revise the geography of the British Isles.

History.

Both Years.—Hitherto we have been considering the Revolution from a French and from a universal point of view. We have seen what were the causes of it, and what were the objects the Revolutionists had in view. We have seen, also, to what excesses some went in their endeavour to carry their plans into execution, and how it all ended in making one man absolute master of France, and leading him to seek to become absolute master of Europe. We will now consider the matter from a narrower point of view, and see how this great political movement across the Channel affected our own country and was affected by it.

In order to thoroughly understand this, it is necessary to distinguish clearly between *policy*, *strategy*, and *tactics*. By policy we mean that general line of national conduct which it is the duty of the ministry to decide upon, as best suited to advance the general interests and protect the welfare of the country. It includes the decision of the directions in which our influence is to be extended or restricted, with which countries it is best to co-operate and enter into alliance, and how best to acquire the material means for bringing their objects about. By strategy we denote the broad general principles which underlie the disposition of the naval and military forces of the country, in order to carry out the plans formulated by the statesmen, and to protect those parts which they decide should be protected. Tactics are, finally, the dispositions and movements of the fleets and armies when they are in actual contact. These are generally decided upon whilst the conflict is proceeding.

The man whose influence was most felt in shaping the policy of this country was Pitt. (Read Morley's *Life of Pitt* in Macmillan's English Statesmen Series.) The firm conviction of Pitt was that the interest of the country could best be served by commercial development and by the maintenance of peace. Hence, when the Revolution broke out, he resolutely opposed any proposal to interfere with the internal affairs of France. The execution of the king and the September massacres alike were unable to induce him to interfere, and on no occasion, perhaps, was his strength of character so clearly shown as when he stood alone in his determination not to interfere, in spite of the efforts made by Burke to enlist the country on the side of the royalists. He readily noted whatever signs of friendship were shown by those in power, and was anxious to return the friendship. When at last it was clear that France was bent upon overrunning the territories of our ally, Holland, and would not desist in spite of Pitt's endeavours, he had no other course open than to accept the war.

During the war, Pitt's policy was to maintain the country by protecting its commerce and expanding its naval power.

After his death, in 1806, his policy was continued by Fox and Grenville, who desired to save Europe from the power of Napoleon.

On the other hand, finding that our command over the seas prevented him from inflicting a military blow, and at the same time led to increased commercial prosperity, Napoleon decided upon a policy of injuring us by ruining our commerce; hence the famous Berlin and Milan decrees, to which the British Government replied with the celebrated "Orders in Council," and about which, as well as about the strategy, we shall have to speak next month.

Algebra.

Women—Both Years.—Simple equations with one unknown. Be careful to avoid any mechanical trick in working equations. Every operation performed in solving equations must be based upon one of the following five axioms:—

1. Things which are equal to the same thing are equal to one another.
2. If equals be added to equals, the wholes are equal.
3. If equals be taken from equals, the remainders are equal.
4. If equals be multiplied by the same number, the products are equal.
5. If equals be divided by the same quantity, the quotients are equal.

The first three of these axioms are familiar to our students of Euclid's geometry, while the fourth and fifth are derived from the second and third, since multiplication and division are only particular cases of addition and subtraction. We recommend all students beginning equations to give a reference to one of these axioms for every operation they perform.

Men—First Year.—Further practise quadratics with more than one unknown, and also problems based upon them.

Men—Second Year.—Theory of logarithms. This is treated with sufficient fullness in most text-books of algebra; but the student is advised to read Johnston's *Treatise on Logarithms*, a little book published by Longmans. Before reading the chapter on logarithms, it is advisable to refresh the memory by revising the chapter on the theory of indices.

Euclid.

Women—First Year.—Props. 27–34. Be very careful about 27; then 28 contains two very simple deductions depending upon it, while 29 is the converse of all three. In preparing 30, take the line to which the others are parallel first between the others and then above or below both; 31 is a very easy proposition.

Prop. 32 is in itself easy, although the corollaries *seem* hard; but the difficulty really arises from the length of the expressions which are necessary to denote the angles we are speaking of, and which we cannot letter, since the statement is too general, and we wish to apply it to a figure with *any* number of sides.

Second Year.—Revise Book I., 1–26, and work deductions.

Men—First Year.—Book III. to end of Prop. 29.

Men—Second Year.—Book VI. to end of Prop. 19.

Latin.

See The Practical Teacher Matriculation Course.

French.

Learn the irregular verbs of the third conjugation. Read *Le Roi des Montagnes* (Nelson and Sons) to the end, and finish the exercises.

LONDON MATRICULATION.

JUNE 1901.

BY R. C. B. KERIN, B.A. (LOND.),

First in First Class Classical Honours at Final;
Principal, Carlyon College, 55 Chancery Lane, W.C.

LATIN COURSE FOR NOVEMBER.

1. Sallust, *Catilinæ*, chaps. xxv.–xxxiii.

2. Grammar.—The regular conjugations, and the formation of the tenses; deponent verbs; semi-deponent and quasi-passive verbs; verbs in *-io* of the third conjugation; formation of inceptive, desiderative, frequentative, and diminutive verbs. In the syntax, read the genitive and ablative cases.

3. *Anglicè Reddenda*, Nos. 30–38.

4. Sentences from Bradley's *Arnold* or Bayfield's or Allen's *Exercise Book*.

Notes on Grammar.

Note how the various tenses are formed, and the various parts which a Latin verb possesses. You should digest thoroughly the comparative table of endings which you will find in the grammar. Note that deponent verbs are verbs that are passive in form and active in meaning, and are so called because they have laid down (*depono*) the passive meaning. They are the only verbs that have a perfect active participle; some deponent verbs, however, have a perfect participle with a passive signification.

Note the verbs in *-io* of the third conjugation that drop the *i* before *i*, *e* final, or short *er*, like *iacio*, *morior*, etc. Semi-deponent verbs are passive in form in the perfect tenses. Quasi-passive verbs are verbs that are active in form and passive in meaning—for example, *vēneo*, *fio*.

The translation of the present subjunctive by "may" is only correct (1) in wishes, as "may he be happy," *felix sit*; (2) in a final clause, as *hoc facio ut valeat*, "I do this to make him well;" *abeo ut contentus sis*, "I am going away in order that you may be satisfied." Otherwise, "may" is translated by *licet* when equivalent to "it is permitted," or by *potest fieri ut* when equivalent to "it can be that"—for example, *eis haec facere licet*, "they may do these things;" *potest fieri ut felices sint*, "they may be fortunate."

The pluperfect subjunctive is translated by "should have" when it occurs in a principal sentence, otherwise the pluperfect indicative in English generally translates it. Remember that the Latins are fond of the subjunctive, the English are not.

The two English translations of the Latin perfect should be noted. The context decides which is to be used. It should be remembered that the perfect with "have" is regarded as a primary tense, the perfect without "have" as a secondary tense.

In the syntax, note the remains of the locative case in names of towns and small islands—*domi*, *rure*, *terra marique*, *militiae*. Note the mode of expression when the word *urbs* or *oppidum* is used, as in *urbe Carthagine*, "in the city of Carthage." Note that motion "from" is normally expressed by the ablative with a preposition, except in the names of towns or small islands. "By," after a passive verb, if used (1) with the agent, is translated by *a* or *ab* (with the ablative, *ab* is used before vowels or "h"); (2) if used with the instrument, is not translated, and the ablative alone is employed. With regard to the method of expressing price, the genitive is used for indefinite, the ablative for definite (and sometimes indefinite) price—as, *hoc pluris vendidit*, *hoc quinque sestertiis vendidit*. Learn the distinction between the ablative and genitive of quality, noting that the nouns in the ablative or genitive must have an adjective—for example, "a man of note" is *vir insignis*. The genitive of quality refers only to internal qualities.

The ablative of attendant circumstances, or ablative absolute, is very important. The examples of it given in the grammar are well worth studying. The following are the limits to its use:—1. The subject of it must be independent of the rest of the sentence: for example, *nobis absentibus culpavit*, "he blamed us when absent," is not to be imitated. The sentence should run, *nos absentes culpavit*. 2. The ablative absolute should be a short clause.

Poetical and Greek usages of the genitive and ablative are important. Note the following:—(1) Genitive of respect, *integer vitae*, "upright in life;" (2) genitive of separation, *purus sceleris*, "free from crime;" (3) genitive of cause, *notus in fratres paterni animi*, "known on account of his fatherly feelings towards his brothers;" (4) ablative of place without a preposition. Note the different methods of translating the preposition "with" into Latin. The constructions of *dignus*, *indignus*, *contentus*, and *fretus* are important. Students should avoid using *dignus* and *indignus* with genitive, as that construction is not found in Cicero. Distinguish the subjective and objective genitive—for example, *amor patris*, "the love felt by a father" (the father is the subject of the love), subjective genitive; *amor patris*, "the love felt for a father" (the father is the object of the love), objective genitive. The predicative genitive is the genitive used as a predicate with the verb *est*—as, *sapientis est hoc dicere*, "it is the mark (sign, characteristic) of a wise man to say this." Note the constructions of *interest rĕfert*, *circumdo*, *induo*, *fruor*, *fungor*, *vescor*, *nitor*, *opus est*, *interdico*. The classes of verbs that are followed by the genitive or ablative are important. Among the principal genitives expressing offences, which accompany verbs and adjectives of accusing, note the following:—*veneni* (poisoning), *maiestatis* (high treason—the full phrase is *laesae maiestatis*), *repetundarum* (extortion), *furti* (theft), *ambitus* (bribery), *peculatus* (embezzlement), *caedis* (murder), *homicidii* (manslaughter). Note—"to accuse of violence or assassination," *de vi*, *inter sicarios accusare*. Note the partitive genitive, remembering that "all of us" is not expressed in Latin by *omnes nostrum*, but by *nos omnes*; as "of us" is not a real partitive genitive, since "all" is co-extensive with "us," and not a part of it. Note *ad Vestae ventum est* (where *templum* is omitted), "he came to the temple of Vesta." (Literally, "it was come to the temple of Vesta.") Note that the ablative expresses (1) point of time; (2) time within which an event happens. Also note the different ways of translating "three days after." If *post* comes first, use accusative; if last, use ablative; if between the "three" and the "days," either ablative or accusative.

Typical Sentences.

10. "Who is there who says that the soldiers are too brave to injure the wretched citizens?"

Quis est qui dicat hostes fortiores esse quam qui miseris civibus noceant.

Notes.—(*a*) *Qui* takes the subjunctive here, because the antecedent is indefinite. The sentence is equivalent to "who is there of such a kind as to say." This subjunctive is called the "generic" subjunctive. (*b*) "Too," followed by an adjective and the infinitive, must be translated by the comparative of the adjective, *quam qui* (*ut*), and the subjunctive, or by *tam* and the positive of the adjective, followed by *ut non* ("so that not") and the subjunctive. The literal translation of the rendering given above is, "are braver than who would injure." The alternative rendering would be, *tam fortes esse ut non.....noceant*. (*c*) For the present subjunctive, see rule for sequence of tenses (4) (*c*).

11. "No sooner had news been brought that the city had been given up by the citizens, than he promised to sell to each of the citizens forty pecks of corn, at ten sesterces per peck."

Simul ac urbem a civibus traditam nuntiatum est, quadragenos frumenti modios sestertiis denis civibus singulis se venditurum promisit.

Notes.—(*a*) "No sooner had news been brought.....than he" = "As soon as news had been brought.....he,"—*Simul ac* and indicative. (*b*) Note accusative and infinitive after a verb of hearing, according to previous rules. (*c*) Verbs of promising are followed by the accusative and future infinitive. (*d*) *Venditurum*, not *venditurus*, because it agrees with *se*. (*e*) "Each," when it means "each one taken singly," is translated not by *quisque*, but by *singuli*, agreeing with the noun. (*f*) *Quadragenos* is used to denote "forty a piece." (*g*) *Denis* is used to denote that each peck cost ten sesterces. (*h*) *Sestertius* is equal to two and a half asses. (*N.B.*—1,000 H.S. = £8, 10s.) (*i*) *Sestertiis* is the ablative of price. The definite price is always expressed by the ablative. (*k*) Note *nuntiatum est* used impersonally; literally, "it was announced."

12. "It seems that your friend remained at Thebes five years without hearing this."

Amicus tuus Thebis quinque annos mansisse nec hoc videtur audivisse.

Notes.—(*a*) When "it is said" and "it seems" are followed by a "that" clause, the Latins use the personal construction. (*b*) Note the accusative of time, "how long." (*c*) "Without" and a verbal noun after a positive clause are expressed by *nec* and the same mood and tense as in the positive clause. (*d*) "Thebes," Latin *Thebae*, plural word, first declension.

13. "All of you feared that the general would be prevented by the soldiers from taking by storm the city of Naples."

Omnes timebatis ne a militibus imperator prohiberetur quominus urbem Neapolim expugnaret.

Notes.—(*a*) "All of you" must *not* be translated by *omnes vestrum*, as "of you" is not a true partitive genitive, but "all" and "you" are co-extensive; hence say "you all:" the "you"

can be omitted, as it is contained in the termination of the verb. (*b*) After verbs of fearing, a "that" clause is expressed by *ne* and the subjunctive, a "that not" clause by *ut* (or *ne non*) and the subjunctive; an infinitive in English is expressed by an infinitive in Latin. *Ut* after a verb of hearing really means "how;" and if you say, "I fear how he is to do this," it is equivalent to, "I fear he will not do this." (*c*) The tense of *prohiberetur* is due to the fact that *timebatis* is a past tense, and that the action of preventing is future to that of "fearing." (*d*) Note *Neapolim* in apposition to *urbem*, instead of being in the genitive, as you would expect from the English.

Sentences.

(Readers can have their version corrected by sending it to the Editor, Matriculation Course, *P. T.*, and enclosing seven stamps.)

1. Who is afraid that he will prevent your father from going to the city of Naples?
2. Some were afraid that you would be prevented by the weather from starting.
3. Who is there who is too lazy to do this at such a crisis as this?
4. There is no one who does not praise such men as these.
5. No sooner had he heard what your friend was doing than he went into the city.
6. He says he will sell 100 pecks of corn to the soldiers at 4 sesterces per peck.
7. We cannot prevent him from believing this scoundrel.
8. He thought that you had favoured the Conservatives (*Optimates*).
9. Each of us knows how many twice two is.
10. It is difficult to say why this man was put to death by the king without his case being heard.

Test Paper—Latin.

(Readers can have their solutions corrected by sending them to Editor Matriculation Course, *P. T.*, and enclosing 7 stamps.)

1. Give the genitive singular and plural (when found) and the gender of the following words:—*senex*, *ōs*, *ōs*, *taeter*, *volnus*, *palus*. Mark the quantity of each vowel except in the case of the vowels long by position.
2. Give the Latin for 3,000 men; 4,000 soldiers; 2,520 men; 2,003 sailors; $\frac{3}{5}$; $\frac{1}{4}$; $\frac{1}{8}$; $\frac{7}{8}$; 200 times; 50 apiece; three times twenty are sixty.
3. Explain the formation of desiderative, inceptive, and frequentative verbs. Give examples.
4. Explain the terms:—quasi-passive, deponent, and semi-deponent verbs. Give examples.
5. What participles do deponent verbs possess which other verbs do not? How are these deficiencies supplied in ordinary verbs? Give examples.
6. Mention (with examples) the chief syntactical usages of the ablative.
7. Explain the terms:—cognate accusative, predicative dative, subjective genitive, objective genitive, ethical dative, predicative genitive.
8. If a verb governs two accusatives in the active, what becomes of the two accusatives when the verb becomes passive? Illustrate your answer by examples.

ENGLISH COURSE FOR NOVEMBER.

1. Grammar.—Verbs. Nesfield, pp. 45–58, 62–70, 72–75, 347–353.
2. History.—From the accession of Henry III. to the death of Edward III.

Grammar Notes.

The definition of a verb is important. Note how verbs are classified into—(*a*) transitive, auxiliary, and intransitive; (*b*) weak and strong. Note what is meant by factitive verbs (§ 142). Note in § 145 how transitive verbs are sometimes used intransitively. Note what is meant by a verb of incomplete predication. Note how intransitive verbs can become transitive (§§ 152, 153). Note the meaning of the term *notional verb* (§ 154). Learn (§ 158) the definition of voice. Note in § 163 the explanation of expressions like "the house is building," etc. In §§ 164, etc., you should learn the definition of mood, and the names and characteristics of the various moods. With regard to the infinitive, you should be able to state why the infinitive is so called, and also when the infinitive is used without the preposition "to." In Old English "to" was used with the dative or gerundial infinitive to express a purpose. Through false analogy probably, or in order to distinguish the infinitive when the ending was lost, the "to" was used with the infinitive in cases where it had no signification. In sentences like, "What went ye out for to see?" the use of the infinitive is in accordance with ancient usage. The history of this infinitive is very well given in § 520. Note in § 191 the various usages of the infinitive.

The history and usage of the participles and verbal nouns in *-ing* are most important. The history of the gerund is dealt with in detail in § 523, the history of the participle in § 517. Briefly summarising these sections, we may state that the present participle originally ended in *-ende*, *-inde*, or *-and*; that towards the end of the twelfth century the suffix *-inge* of the gerund began to be substituted first, and this substitution was established by 1350. The so-called verbal noun originally ended in *-ing* or *-ung*, and was used merely as a noun pure and simple; through analogy with the present participle, it assumed its power of governing a case. Hence at the present day there is often confusion between the present participle in *-ing* and the verbal noun, especially in sentences like the following, "I do not mind you coming," where "you" should be "your," as "coming," since it is a noun, must be qualified by an adjective. Note also the origin of expressions like "after having done this," formed on analogy of the perfect active participle. As there was a participle present "writing," to which a verbal noun "writing" corresponded, so an illegitimate form like the above was created.

GEOMETRY COURSE.

Read Euclid, Book II.

Solutions to riders of last month:—

1. By Euclid I. 21—

BA and AC are greater than BO and OC.
AC and CB are greater than AO and OB.
CB and BA are greater than CO and OA.

Adding and halving, we obtain the required result.

2. Take any line AB drawn to scale of length two inches. At B draw BC perpendicular to AB, and make BC of length three inches. Join AC. Then, by Euclid I. 47,

$$AC^2 = AB^2 + BC^2 = 4 + 9 = 13.$$
$$\therefore AC = \sqrt{13} \text{ inches.}$$

3. This is proved in the course of the proof of I. 47.

4. Let ABC be given triangle. Bisect BC in D. Through A draw AP parallel to BC. Bisect BD in E, and at E draw EP perpendicular to BD to meet AP in P. Join DA, PB, PD, and complete the rhombus PDNB.

It is clear by I. 4 that PBD is an isosceles triangle equal in area to triangle ABD (I. 37)—that is, to half of triangle ABC. Now, since PD = PB, PDNB is a rhombus whose area is twice that of triangle PBD—that is, equal to that of triangle ABC.

Riders:—

1. To divide a straight line externally so that the rectangle contained by whole line thus produced and the part produced is equal to the square on the part produced.

2. Construct a rectangle equal to the difference of two given squares.

ARITHMETIC COURSE.

Read chapters xix., xx., and xxi. of Pendlebury.

Solutions and answers to examples:—

1. It is evident that any number which will exactly divide by 2, 3, 4, 5, 6, 7, 8, and 9 is one larger than the required number. Now the least number exactly divisible by 2, 3, 4, 5, 6, 7, 8, and 9 is their L.C.M., which can be found by the usual method to be 2520; hence 2519 is the number required.

2. Working to four places for safety, we get 2·9997, or to three places, 3·000, as we drop the 7 and add 1 to the 9 on its left.

Example:—

1. A sum of £1640 is borrowed, to be paid back in two years by two equal annual payments, allowing 5 per cent. compound interest. Find the annual payment.

ALGEBRA COURSE.

Read chapters xix. and xx. of Hall and Knight, and work plenty of the examples, especially that set called xx. *b*.

Solutions to examples:—

1. $x^6 - x^5 - x^4 + x = x^5(x - 1) - x(x^3 - 1)$
$= x^5(x - 1) - x(x - 1)(x^2 + x + 1)$
$= x(x - 1)(x^4 - x^3 - x - 1).$
$x^6 - 1 = (x^3 + 1)(x^3 - 1) = (x + 1)(x^2 - x + 1)(x - 1)(x^2 + x + 1).$

2. $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
$= y(a^2 + ab + b^2).$
Now $x^2 = a^2 + 2ab + b^2,$
$y^2 = a^2 - 2ab + b^2.$
Adding, $x^2 + y^2 = 2(a^2 + b^2).$
Subtracting, $x^2 - y^2 = 4ab.$

$$\therefore a^2 + ab + b^2 = a^2 + b^2 + ab = \frac{x^2 + y^2}{2} + \frac{x^2 - y^2}{4}$$
$$= \frac{3x^2 + y^2}{4}.$$
$$\therefore a^2 - b^2 = \frac{y(3x^2 + y^2)}{4}.$$

Let $a = 5002$, $b = 4998$.
$\therefore x = 10000$, $y = 4$.
$$\therefore a^2 - b^2 = \frac{y(3x^2 + y^2)}{4} = \frac{4(3 \cdot 10000^2 + 16)}{4} = 300000016.$$

SCIENCE AND MECHANICS.

Loney's *Mechanics and Hydrostatics*, chapters iii. and xiv., are to be read. In Science, chapters viii. and ix. of the Mechanics portion, and chapter iv. of the Light portion. Mr. Cartwright's articles on Science, elsewhere in THE PRACTICAL TEACHER, should be carefully followed.

1. The numbers 4242, 2903, when divided by a certain number of three digits, leave the same remainder. Find that remainder. (June 1899.)

Whatever number divides both 4242 and 2903, giving the same remainder, must divide their difference without remainder—that is, must divide 4242 − 2903, or 1339, without remainder.

Now $1339 = 13 \times 103$, so that the number must be either 13 or 103; but it being given to be of three digits, it must be 103.

By trial, $4242 \div 103 = 41$ and 19 over; and $2903 \div 103 = 28$ and 19 over.

2. A man invests equal sums in 3 per cent. stock at 96, and in 4 per cent. railway debentures at 127. What percentage will he get for his money on the whole? (June 1899.)

Suppose him to invest £50 in each stock.

Then his income from the former $= £\frac{50 \times 3}{96} = £\frac{25}{16} = £1, 11s. 3d.$,

and that from the latter $= £\frac{50 \times 4}{127} = £\frac{200}{127} = £1, 12s. 4d.$ approximately. He having invested exactly £100, will hence get the addition of these two amounts—that is, £3, 3s. 7d.—as the percentage required.

3. Why ought water at the top of a waterfall to be cooler than that at the bottom? Assuming the mechanical value of the specific heat of water to be 87 foot pounds per ounce (for 1° C.), and that Niagara is 160 feet high, calculate how much the difference of temperature ought to be for that waterfall. (June 1899.)

Water at the top of a waterfall possesses potential energy. This is converted into kinetic energy during the fall, and this latter partly into heat at the bottom.

Assuming that the whole of the potential energy is converted into heat at the bottom, we will calculate the potential energy of 1 oz. of water at a height of 160 feet. It is $\frac{160}{16}$, or 10 ft. lbs.

Now 87 ft. lbs. will raise 1 oz. of water 1° C.

$\therefore$ 10 ft. lbs. will raise it $\frac{10}{87}$° C.

$\therefore$ the difference of temperature required is $\frac{10}{87}$° C.

4. Prove that the sum of n terms of the series
$$1, 1 + r, 1 + r + r^2, 1 + r + r^2 + r^3 \ldots$$
is $$\frac{n - (n+1)r + r^{n+1}}{(1-r)^2}.$$

Let $s = 1 + (1 + r) + (1 + r + r^2) + \ldots$ to n terms
$$= 1 + \frac{1 - r^2}{1 - r} + \frac{1 - r^3}{1 - r} + \frac{1 - r^4}{1 - r} + \ldots \text{ to } n \text{ terms}$$
$$= 1 + \frac{1}{1 - r} - \frac{r^2}{1 - r} + \frac{1}{1 - r} - \frac{r^3}{1 - r} + \ldots$$
$$= 1 + \left(\frac{1}{1 - r} + \frac{1}{1 - r} + \ldots \text{ to } (n-1) \text{ terms}\right)$$
$$- \frac{1}{1 - r}(r^2 + r^3 + r^4 \ldots \text{ to } (n-1) \text{ terms})$$
$$= 1 + \frac{n - 1}{1 - r} - \frac{1}{1 - r} \cdot \frac{r^2(1 - r^{n-1})}{1 - r}$$
$$= \frac{(1 - r)^2 + (n - 1)(1 - r) - r^2(1 - r^{n-1})}{(1 - r)^2}$$
$$= \frac{1 - 2r + r^2 + n - nr - 1 + r - r^2 + r^{n+1}}{(1 - r)^2}$$
$$= \frac{n - (n+1)r + r^{n+1}}{(1 - r)^3}.$$

5. By adding 30 yards to the length and 10 yards to the breadth of a square field its area is doubled. Find its original area in square yards. (June 1898.)

Let x yards = side of original field.
$\therefore x^2$ square yards = its area.
Length of new field $= x + 30$ yards.
Breadth of new field $= x + 10$ yards.
$\therefore$ area of new field $= (x + 30)(x + 10)$ square yards.
$\therefore (x + 30)(x + 10) = 2x^2$.
$\therefore x^2 + 40x + 300 = 2x^2$.
$\therefore x^2 - 40x - 300 = 0$.
$\therefore x^2 - 40x = 300$.
$\therefore x^2 - 40x + 400 = 700$.
$\therefore x - 20 = \pm 10\sqrt{7} = \pm 26$ approximately.
$\therefore x = 46$, or -6.

The negative answer being inadmissible, side of original field = 46 yards.
$\therefore$ area $= 46^2$, or 2116 square yards approximately.

6. Solve $(a^2 - b^2)(1 + x^2) = 2(a^2 + b^2)x$. (June 1898.)
$$(a^2 - b^2)x^2 - 2(a^2 + b^2)x + a^2 - b^2 = 0.$$
$$\therefore x^2 - \frac{2(a^2 + b^2)}{a^2 - b^2}x = -1.$$
$$\therefore x^2 - \frac{2(a^2 + b^2)}{a^2 - b^2}x + \left(\frac{a^2 + b^2}{a^2 - b^2}\right)^2 = \left(\frac{a^2 + b^2}{a^2 - b^2}\right)^2 - 1$$
$$= \frac{a^4 + 2a^2b^2 + b^4}{a^4 - 2a^2b^2 + b^4} - 1$$
$$= \frac{4a^2b^2}{(a^2 - b^2)^2}.$$
$$\therefore x - \frac{a^2 + b^2}{a^2 - b^2} = \pm \frac{2ab}{a^2 - b^2}.$$
$$\therefore x = \frac{a^2 + b^2 \pm 2ab}{a^2 - b^2} = \frac{(a - b)^2}{a^2 - b^2}, \text{ or } \frac{(a + b)^2}{a^2 - b^2}$$
$$= \frac{a - b}{a + b}, \text{ or } \frac{a + b}{a - b}.$$

QUERY COLUMN.

RULES.

1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the name and address of the correspondent, and the *coupon* which appears on the back wrapper of the current number of the Journal.
3. CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

Onyx.—Get Flux's *Expansion of the British Empire* (A. M. Holden), and "*Sections One and Two*" *Physiography* (Nelson and Sons).

Blowpipe Lamp, Durham.—If you will write to Messrs. Letcher and Sons, 25 Turnpike Lane, Hornsey, London, N., you will get what you want at a price of about 10s.

E.M.A.—We are pleased to receive your letter and good wishes. The Notes on Physiography in our Science Section are intended for Advanced and Honours students.

R.D., Holyrood, Con. Bay, Newfoundland.—We regret we cannot undertake to publish solutions to the batch of problems you have sent. Two are dealt with in this issue. Any good text-book should help you through with others.

Agriculture.—Yes, Fream (Murray, 3s. 6d.) will cover the course; but you will be wise to consult the books of Tanner and Wrightson, if you can obtain access to them. The price of Roscoe's *Chemistry* is 4s. 6d.

Preceptor.—There is nothing new about this so-called new method—not even the name. It is the method of discovery as opposed to the method of telling. You will find an account of it by Professor Armstrong in Mr. Sadler's second volume of Special Reports. Teachers know that it is best for children to discover as much as possible for themselves, and to be told as little as possible. They know, however, that there must be *some* telling, and that is why they do not believe in the heuristic doctrine of all discovery and no telling. It is difficult to say how long, but it is safe to say that you would be longer rather than quicker if you attempted to work entirely on heuristic lines.

W. Mulrooney.—We are of opinion that your institution cannot lay claim to any grants under the Minute of August 24, 1900; but we would advise you to lay your statement before the Scotch Education Department, and obtain their opinion on the matter. We shall be glad to hear if successful.

R. T.—High and Low Moon.—When the moon is full, she is in a straight line with the earth and the sun, the sun being in the opposite part of the heavens to that occupied by the moon, our satellite being at times 5° above, and at times 5° below the sun's circle—that is, the circle made by completing below the horizon the daily path of the sun in the heavens. If, therefore, the sun is high in the heavens at midday, he will be only a few degrees below the northern horizon at midnight, and the moon will be only a little above the southern horizon—that is, if we suppose the sun and the moon to be in the sun's circle spoken of above; if the sun, as in summer, traces out a large part of it above the horizon, the moon will trace out a correspondingly small part of it. Hence, in summer, without considering the fact that the nights are shorter, there is less moonlight than in winter—a very happy arrangement, since the moon is longest above the horizon just at the time when her light is most needed by us.

Xante.—Prove geometrically (when A lies between two and three right angles and B is less than one right angle) that

(i) $\sin (90° + A) = \cos A$.

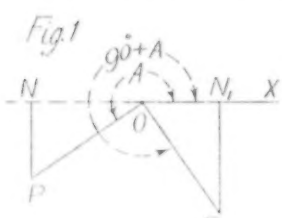
(ii) $\cos (A + B) = \cos A \cos B - \sin A \,.\, \sin B$.

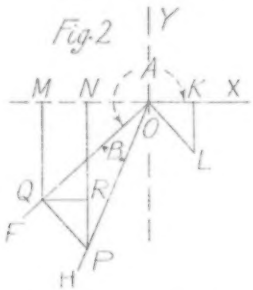
(Cambridge Senior, 1899.)

(i) Let XOP (Fig. 1) be the angle A, and XOP' the angle 90° + A, POP' being 90°. From P, P_1 draw PN, P_1N_1 perpendicular to OX. Then, by definition,

$$\sin (90° + A) = \frac{N_1P_1}{OP_1}.$$

Now, if OP_1 be made equal to OP, the triangles OPN, OP_1N_1 will be equal in all respects. Thus N_1P_1 is equal in





length to ON, and by the convention of signs they are the same in sign, both being negative.

Hence $\sin (90° + A) = \frac{N_1P_1}{OP_1} = \frac{ON}{OP} = \cos A$.

Similarly, $\cos (90° + A) = \frac{ON_1}{OP_1} = \frac{-NP}{OP} = -\sin A$.

(ii) Let XOF be the angle A, which is between two and three right angles. To this add the acute angle FOH equal to B, so XOH is A + B.

In the side OH bounding the angle A + B take a point P, and from P draw perpendiculars PQ and PN to the bounding lines of the angle A. Also draw QM and QP perpendicular and parallel to OX.

ON is called the projection of OP on to OX or XO produced. Similarly, OM is the projection of OQ, and MN (not NM) is that of QP. OL has been drawn parallel and equal to QP, and LK parallel to PR, so that QR = OK.

Now projection of OP = projection of OQ + projection of QP.

(For this is the same as saying that if we start at O and arrive at P by way of OQ and QP, we are then just as far to the left of O as if we had moved straight from O to P along OP.)

Hence ON = OM + MN = OM + QR = OM + OK.

$$OP \cos (A + B) = OQ \cos A + OL \cos XOL$$
$$= (OP \cos B) \cos A + QP \cos (90° + A)$$
$$= OP \cos A \,.\, \cos B + OP \sin B \,.\, \cos (90° + A).$$

$\therefore \cos (A + B) = \cos A \,.\, \cos B - \sin A \,.\, \sin B$,

because $\cos (90° + A) = -\sin A$.

To prove the formulæ for $\sin (A + B)$, $\sin (A - B)$, $\cos (A - B)$, whatever magnitudes A and B may be, we might use the projection method, projecting on to OY instead of OX when dealing with the sine formulæ.

A. S. Robertson.—A man 1·7 metres high changes from the vertical to the horizontal position. If the density of blood be 1·03, calculate the change in blood pressure in his head, assuming that it remains constant in his feet.

As 1·7 metres = 170 centimetres, and 1 centimetre of water weighs 1 gram, we have: The blood pressure in his feet when in a vertical position is that due to a column of liquid of density 1·03 and height 170 cm.

$\therefore$ Pressure = 170 × 1·03 grams.

When in a horizontal position, as the pressure in his feet remains constant, then change of blood pressure in his head = 170 × 1·03 = 175·1 grams.

The following list of books will answer all your requirements:—

History of Chemistry.—*History of Chemistry*, by Ernest von Meyer; *Rise and Development of Organic Chemistry*, by Schorlemmer.

Physical Chemistry.—*Outlines of General Chemistry*, by Ostwald; *Introduction to Physical Chemistry*, by Walker.

General Chemistry.—Roscoe and Schorlemmer, Vols. I. and II.

Organic.—Bernthsen as text-book; Richter, Vols. I. and II., for reference.

Practical.—Qualitative—Valentine; Quantitative—Clowes and Coleman; Organic—Gattermann's *Practical Methods of Organic Chemistry*.

G.G.—The expenses of a school are partly constant and partly vary as the number of boys. The expenses were £1000 for 150 boys, and £840 for 120 boys. What will the expenses be when there are 330 boys? (Hall and Knight's *Algebra*, chap. xxvi.)

If y represent the expenses, and x the number of boys,

$$y = a + bx$$

expresses that the cost is made up of two parts—one part a, which is constant, and the other part bx, which is proportional to x, the number of boys. We have to find the constants a and b.

Put 1000 for y and 150 for x, then

$$1000 = a + 150b.$$

Put 840 for y and 120 for x, then

$$840 = a + 120b.$$

Solving these two equations for a and b, we obtain, on subtraction,

$$160 = 30b,$$

$$\text{or, } b = \frac{16}{3}.$$

$$\therefore a = 1000 - \frac{16}{3} \times 150 = 200.$$

The law for expense is therefore

$$y = 200 + \frac{16}{3}x.$$

Hence, when $x = 330$,

$$y = 200 + \frac{16}{3} \times 330 = 1960.$$

J. Calver.—Find the length of the side of an equilateral triangle inscribed in the parabola $y^2 = 4ax$, so that one angular point is at the focus.

(Coord, *Geom.*, Univ. Tutorial Series, p. 45.)

Since we are concerned with the length of a line drawn from the focus to meet the curve, we naturally use the polar equation. If S is the focus and A the vertex, then it immediately follows from the definition of the parabola that if θ be measured from SA as initial line, then

$$r = \frac{2a}{1 + \cos \theta}.$$

Obviously the side of the equilateral triangle is that value of r corresponding to $\theta = 30°$ or $150°$. Hence required side

$$= \frac{2a}{1 + \cos 30°} \text{ or } \frac{2a}{1 + \cos 150°}$$

$$= \frac{2a}{1 + \frac{\sqrt{3}}{2}} \text{ or } \frac{2a}{1 - \frac{\sqrt{3}}{2}} = \frac{4a}{2 \pm \sqrt{3}}.$$

Ravensdale.—(a) A merchant sold 90 cwt. 3 qrs. 14 lbs. of madder, which cost him 38s. 6d. per cwt., to another, at the rate of 42s. per cwt., the purchase price to be one-quarter cash, and the remaining three-quarters in hemp; if the hemp cost the other merchant 24s. 10d. per cwt., find how much money he would pay, and the price at which he would reckon the hemp, on the supposition that he is to make the same net profit as the first, so that the exchange is equal.

(*b*) **Two trains, A and B, leave P for Q at the same time as two trains, C and D, leave Q for P, all travelling at uniform speeds. A passes C 120 miles from P, and passes D 150 miles from P; B travels at two-thirds of the speed of D. Find the distance from P to Q.** (London Matric., 1900.)

(*a*) **Since 90 cwt. 3 qrs. 14 lbs. = 90 + $\frac{3}{4}$ + $\frac{1}{28}$ = 90$\frac{8}{9}$ cwt., the first merchant should draw from the second the sum of 42s. × 90$\frac{7}{8}$ = 3816$\frac{3}{4}$s.**

As the second merchant has to pay one-quarter in cash, he must pay $\frac{1}{4}$ of 3816s. 9d.—that is, 954s. 2$\frac{1}{4}$d.

The remaining three-quarters—namely, 2862s. 6$\frac{3}{4}$d.—is paid in hemp.

Since the first merchant has a net profit of 3s. 6d. × 90$\frac{7}{8}$, or 318s. 0$\frac{3}{4}$d., and the second merchant has to make the same net profit, the hemp which he sold for 2862s. 6$\frac{3}{4}$d. cost him only 2862s. 6$\frac{3}{4}$d. − 318s. 0$\frac{3}{4}$d., or 2544s. 6d.

The quantity he bought must be $\frac{2544\frac{1}{2}}{24\frac{3}{8}}$ cwt.; and since he sells this quantity for 2862s. 6$\frac{3}{4}$d., the price per cwt. must be—

$$2862\tfrac{27}{40}\text{s.} \div \left(\frac{5089}{2} \times \frac{6}{149}\right)$$
$$= \frac{45801}{16}\text{s.} \times \frac{2 \times 149}{6 \times 5089}$$
$$= \frac{447}{16}\text{s.} = 27\tfrac{15}{16}\text{s.} = 27\text{s. } 11\tfrac{1}{4}\text{d.}$$

Ans. £47, 14s. 2$\frac{1}{4}$d.; £1, 7s. 11$\frac{1}{4}$d.

(*b*) **Let x = required distance.**

Let a, b, c, d be the speeds in miles per hour of the four trains A, B, C, D.

Then A goes 120 miles while C goes $x - 120$.

$$\therefore \frac{a}{c} = \frac{120}{x - 120} \quad \ldots\ldots\ldots \quad (1).$$

Similarly,
$$\frac{a}{d} = \frac{150}{x - 150} \quad \ldots\ldots\ldots \quad (2).$$
$$\frac{b}{c} = \frac{180}{x - 180} \quad \ldots\ldots\ldots \quad (3).$$

Also,
$$b = \frac{2}{3}d, \text{ or } d = \frac{3}{2}b \quad \ldots\ldots \quad (4).$$

Dividing (1) by (3)—
$$\frac{a}{b} = \frac{120\ (x - 180)}{180\ (x - 120)} \quad \ldots\ldots \quad (5).$$

Also, by (4), (2) becomes
$$\frac{a}{b} \cdot \frac{2}{3} = \frac{150}{x - 150} \quad \ldots\ldots\ldots \quad (6).$$

By using (5), (6) becomes
$$\frac{120}{180} \cdot \frac{x - 180}{x - 120} \cdot \frac{2}{3} = \frac{150}{x - 150};$$
or, $4(x - 180)(x - 150) = 9 \times 150 \times (x - 120)$,
$$4(x^2 - 330x + 27000) = 1350x - 162000,$$
$$4x^2 - 2670x = -270000,$$
$$x^2 - \frac{2670}{4}x + \left(\frac{1335}{4}\right)^2 = -67500 + \frac{1782225}{16},$$
$$x - \frac{1335}{4} = \pm\sqrt{\frac{702225}{16}} = \pm 209{\cdot}5,$$
$$x = 543{\cdot}2.$$

Ans. 543·2 miles.

A. W. B.—(*a*) **Given the volume of a right circular cone, find the ratio of the height to the radius of the base if the curved surface is to be the smallest possible.**

(*b*) **Given a sphere, a cone is inscribed in it such that the area of its curved surface is the greatest possible. Find its altitude, and prove that its volume is $\frac{8}{27}$ of the volume of the sphere.** (R.U.I., B.A., 1900.)

(*a*) **Let a be half the vertical angle of the cone, r the radius of the base, v the volume, c the area of the curved surface, and h the altitude.**

Then
$$v = \frac{\pi r^2 h}{3} = \frac{\pi r^2 (r \cot a)}{3} = \frac{\pi r^3 \cot a}{3},$$
$$c = 2\pi r \frac{r \operatorname{cosec} a}{2} = \pi r^2 \operatorname{cosec} a.$$

Therefore
$$\frac{c}{v} = \frac{3\pi r^2 \operatorname{cosec} a}{\pi r^3 h} = \frac{3 \operatorname{cosec} a}{h} = \frac{3 \operatorname{cosec} a}{r \cot a}$$
$$= \frac{3}{r \cos a}.$$

But
$$r^3 = \frac{3v}{\pi \cot a}. \quad \therefore r = \left(\frac{3v}{\pi} \tan a\right)^{\frac{1}{3}} = k \tan^{\frac{1}{3}} a,$$

where k is a constant equal to $\left(\frac{3v}{\pi}\right)^{\frac{1}{3}}$.

$$\therefore \frac{c}{v} = \frac{3 \operatorname{cosec} a}{k \tan^{\frac{1}{3}} a \cot a} = \frac{3}{k \sin a \cot^{\frac{2}{3}} a}$$
$$= \frac{3}{k \sin^{\frac{1}{3}} a \cos^{\frac{2}{3}} a}.$$

This will be a minimum when $\sin^{\frac{1}{3}} a \cos^{\frac{2}{3}} a$ is a maximum, or when its cube, $\sin a \cos^2 a$, is a maximum.

Now $\sin a \cos^2 a = \sin a - \sin^3 a$; and differentiating the latter, we obtain

$$\cos a - 3 \sin^2 a \cos a, \text{ or } \cos a (1 - 3 \sin^2 a).$$

For a maximum equate this to zero, when $\cos a = 0$, or $1 - 3 \sin^2 a = 0$.

Cos a cannot be zero, hence

$$1 - 3 \sin^2 a = 0, \text{ or } \sin a = \frac{1}{\sqrt{3}}.$$
$$\therefore \frac{h}{r} = \cot a = \sqrt{2}.$$

(*b*) **Let r be the radius of the sphere, x the radius of the base of the cone, a the semi-vertical angle, c the curved surface of the cone.**

$$\text{Now } c = 2\pi x \times \frac{2r \cos a}{2} = 2\pi r x \cos a.$$

But $x = r \sin 2a$.

$$\therefore c = 2\pi r^2 \sin 2a \cos a.$$

This will be a maximum when $\sin 2a \cos a$ is a maximum, or when $\sin a \cos^2 a$ is a maximum—that is, when $\cot a = \sqrt{2}$, as in last example.

The altitude = (length of generator) cos a
$$= 2r \cos a \cos a$$
$$= 2r \frac{\sqrt{2}}{\sqrt{3}} \frac{\sqrt{2}}{\sqrt{3}} = \frac{4r}{3}.$$

$$\text{Volume of cone} = \pi x^2 \times \frac{4r}{9} = \pi r^2 \sin^2 2a \times \frac{4r}{9}$$
$$= \frac{4r^3\pi}{9} \times \frac{8}{9} = \frac{32\pi r^3}{81}.$$

$$\text{Volume of sphere} = \frac{4\pi r^3}{3}.$$

$$\therefore \frac{\text{Vol. of cone}}{\text{Vol. of sphere}} = \frac{32\pi r^3}{81} \times \frac{3}{4\pi r^3} = \frac{8}{27}. \quad \text{Ans.}$$

These problems belong to maxima and minima, a subject generally dealt with in text-books on the differential calculus—for example, Edwards' *Differential Calculus for Beginners* (Macmillan), chap. xiii.

Thomas.—**If x, y, a be in A.P.; x, y, b in G.P.; x, y, c in H.P.; show that $b(c - a)^2 = 4c(b - a)(c - b)$.** (Cambridge Senior, 1888.)

From the three given conditions we derive the following:—

$$x + a = 2y \quad \ldots\ldots \quad (1).$$
$$xb = y^2 \quad \ldots\ldots \quad (2).$$
$$\frac{2cx}{x + c} = y \quad \ldots\ldots \quad (3).$$

We have to get rid of x and y.

From (1) and (2), $\frac{y^2}{b} + a = 2y.$

$$y^2 - 2by + ab = 0 \quad \ldots\ldots \quad (4).$$

From (2) and (3), $\frac{\frac{2cy^2}{b}}{\frac{y^2}{b} + c} = y,$

which becomes
$$y^2 - 2cy + bc = 0 \quad \ldots\ldots \quad (5).$$

Solving the simultaneous equations (4) and (5) for y^2 and y, we obtain—

$$y = \frac{b}{2} \cdot \frac{c - a}{c - b} \quad \ldots\ldots \quad (6),$$

and
$$y^2 = \frac{bc(b - a)}{c - b} \quad \ldots\ldots \quad (7).$$

Squaring (6), and equating to (7), we obtain—

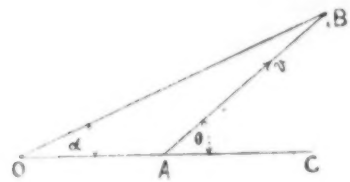
$$\frac{b^2(c - a)^2}{4(c - b)^2} = \frac{bc(b - a)}{(c - b)},$$

or
$$b(c - a)^2 = 4bc(b - a)(c - b).$$

Ploughed.—A shot whose mass is $\frac{1}{n}$th of the mass of the gun and carriage is fired at an inclination θ to the horizontal. If α be the inclination of the gun, prove that

$$\tan\theta = \left(1 + \frac{1}{n}\right)\tan\alpha.$$

At the instant that the shot leaves the gun the components of its motion will consist of a velocity along the axis of the gun, and the reversed horizontal velocity of the gun due to recoil.



If M denotes the mass, and V the velocity of the gun, and m and v the mass and velocity of the shot, then, when fired in a horizontal direction, the velocity of the gun can be obtained from $MV = mv$.

But $m = \frac{M}{n}$. $\quad\therefore V = \frac{v}{n}$.

As the shot is fired at an inclination θ to the horizon, the velocity of the gun will be $\frac{1}{n}$th the horizontal component of the velocity of the shot.

$$\therefore V = \frac{v\cos\theta}{n}. \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

Set out BOA at an angle α, and BAC at an angle θ, making AB = v. Then we have the relations—

$$v\sin\theta = OB\sin\alpha. \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

$$\text{Also, } v\cos\theta + V = OB\cos\alpha. \quad . \quad . \quad . \quad . \quad . \quad (3)$$

Dividing (2) by (3),

$$\frac{v\sin\theta}{v\cos\theta + V} = \frac{OB\sin\alpha}{OB\cos\alpha} = \tan\alpha.$$

Substitute the value of V from (1), and we obtain

$$\frac{v\sin\theta}{v\cos\theta + \frac{v\cos\theta}{n}} = \tan\alpha.$$

$$\therefore \frac{v\sin\theta}{v\cos\theta\left(1 + \frac{1}{n}\right)} = \tan\alpha.$$

$$\therefore \tan\theta = \left(1 + \frac{1}{n}\right)\tan\alpha.$$

Edith.—Show that

$$\sec(x + 45^\circ) + \operatorname{cosec}(x + 45^\circ) = 2\sqrt{2}\cos x\sec 2x.$$

(Cambridge Senior, 1899.)

Left-hand side

$$= \frac{1}{\cos(x + 45^\circ)} + \frac{1}{\sin(x + 45^\circ)}$$

$$= \frac{\sin(x + 45^\circ) + \cos(x + 45^\circ)}{\sin(x + 45^\circ)\,.\,\cos x + 45^\circ}$$

$$= \frac{2[\sin x\cos 45^\circ + \cos x\,.\,\sin 45^\circ + \cos x\,.\,\cos 45^\circ - \sin x\,.\,\sin 45^\circ]}{2\sin(x + 45^\circ)\,.\,\cos(x + 45^\circ)}$$

$$= \frac{2\left[\sin x\,\frac{1}{\sqrt{2}} + \cos x\,\frac{1}{\sqrt{2}} + \cos x\,.\,\frac{1}{\sqrt{2}} - \sin x\,.\,\frac{1}{\sqrt{2}}\right]}{\sin 2(x + 45^\circ)}$$

$$= \frac{\sqrt{2}(2\cos x)}{\sin(90^\circ + 2x)}$$

$$= \frac{2\sqrt{2}\cos x}{\cos 2x}$$

$$= 2\sqrt{2}\cos x\,.\,\sec 2x.$$

W.M.A.—In any triangle, show that the shorter median bisects the greater side. (Hall and Stevens's *Euclid*, p. 105.)

Let it be given in figure, p. 105, that CZ is less than BY; to prove that AB is greater than AC.

By the corollary on p. 105, OZ is one-third of CZ, and OY one-third of BY; hence, since CZ is less than BY, OZ must be less than OY, and therefore CO, the double of OZ, is less than BO, the double of OY. Hence

Angle OCB is greater than OBC (I. 18) . . . (1).

Produce OZ to N, making ON = OY, and OC to M, making OM = OB; then the triangles ONB, OYM are equal in all respects (I. 4). Hence

Angle OCY is greater than OMY (I. 16).

$\therefore$ Angle OCY is greater than OBN.

$\therefore$ Angle OCY is greater than OBZ . . . . . (2).

Therefore, from (1) and (2), by adding,

Angle YCB is greater than ZBC.

$\therefore$ AB is greater than AC (I. 19).

Bike.—Show that the sections of the two ellipsoids,

$$3x^2 + 5y^2 + z^2 = 15,$$

$$\frac{x^2}{3} + y^2 + \frac{z^2}{13} = 1,$$

made by any of the principal planes, are confocal ellipses.

The normal at any point P on the first ellipsoid meets in Q, Q′ those tangent planes to the second ellipsoid which are perpendicular to this normal. Prove that PQ . PQ′ = 2.

(Science and Art, Stage 6, 1900.)

Dividing throughout by 15 in (1), we have—

$$\frac{x^2}{5} + \frac{y^2}{3} + \frac{z^2}{15} = 1,$$

$$\frac{x^2}{3} + y^2 + \frac{z^2}{13} = 1.$$

These ellipsoids have their centres at the origin, and they are cut by the principal plane $z = 0$ in the ellipses,

$$\frac{x^2}{5} + \frac{y^2}{3} = 1,$$

$$\frac{x^2}{3} + y^2 = 1.$$

For these to be confocal, $a^2 - b^2$ (the square of the distance between centre and focus) must be the same for both; this is the case, for

$$a^2 - b^2 = 5 - 3, \text{ and } a^2 - b^2 = 3 - 1.$$

The equation to the normal to (1) at the point x', y', z' is—

$$\frac{5(x - x')}{x'} = \frac{3(y - y')}{y'} = \frac{(z - z')15}{z'}.$$

The equation to a tangent plane to any ellipsoid, in terms of its axes and the direction cosines of its normal, is—

$$lx + my + nz = \pm\sqrt{a^2l^2 + b^2m^2 + c^2n^2}.$$

For a tangent plane to ellipsoid (2) perpendicular to the above normal—

$$l = \frac{x'}{5};\ m = \frac{y'}{3};\ n = \frac{z'}{15}.$$

Hence the two tangent planes in question are—

$$\frac{x'x}{5} + \frac{y'y}{3} + \frac{z'z}{15} = \pm\sqrt{\frac{3x'^2}{25} + \frac{y'^2}{9} + \frac{13z'^2}{225}}.$$

If these are referred to parallel axes passing through the point x', y', z', they become—

$$\frac{x'(x - x')}{5} + \frac{y'(y - y')}{3} + \frac{z'(z - z')}{15} = \pm\sqrt{\frac{3x'^2}{25} + \frac{y'^2}{9} + \frac{13z'^2}{225}}.$$

The perpendiculars from the origin on to these two planes are given by—

$$\frac{\pm\sqrt{\frac{3x'^2}{25} + \frac{y'^2}{9} + \frac{13z'^2}{225}} + \frac{x'^2}{5} + \frac{y'^2}{3} + \frac{z'^2}{15}}{\sqrt{\frac{x'^2}{25} + \frac{y'^2}{9} + \frac{z'^2}{225}}};$$

and their product is—

$$\frac{1 - \left(\frac{3x'^2}{25} + \frac{y'^2}{9} + \frac{13z'^2}{225}\right)}{\frac{x'^2}{25} + \frac{y'^2}{9} + \frac{z'^2}{225}}$$

$$= \frac{225 - 27x'^2 - 25y'^2 - 13z'^2}{9x'^2 + 25y'^2 + z'^2}.$$

Since $225 = 15 \times 15 = 15(3x'^2 + 5y'^2 + z'^2)$, the above reduces to 2.

Patmos.—We fear that you will be disappointed if you expect to find such a book as you refer to. The only way is to consult several books—*Dynamics*, by Williamson and Tarleton (Longmans, Green, and Co.); *Uniplanar Kinematics of Solids and Fluids*, by Professor Minchin (Clarendon Press); *Hydrostatics*, by A. G. Greenhill (Macmillan); Loney's *Statics*.

Solutions to queries sent by *Tyler*, *Macrae*, *Zante*, *Ciris* may be had by post. Name and address should be sent to editor *P. T.*

OUR SCIENCE SECTION

☛ **Subscribers requiring Explanations of Difficulties in any branch of Science, or Advice upon Courses of Study, can obtain all help required by communicating with the Editor, and accompanying their query with the Coupon cut from this Number.**

STAR STUDY

FOR SCHOLARSHIP STUDENTS.

XII.—NOVEMBER.

IN the **Zenith** will be found Cassiopeia (the Lady's Chair), Andromeda, and Perseus.

The **North** is resplendent with Ursa Minor, Cepheus, Draco, and Ursa Major.

The **East** displays Leo, Cancer, Gemini, Auriga, Taurus, Pleiades, with Orion just rising.

In the **South**, Pegasus, Aries, Aquarius, Pisces, Cetus, and the first-magnitude star Fomalhaut of the Southern Fish, will be seen.

The **West** is bright with Cygnus, Aquila, Lyra, with Capricornus in the south-west.

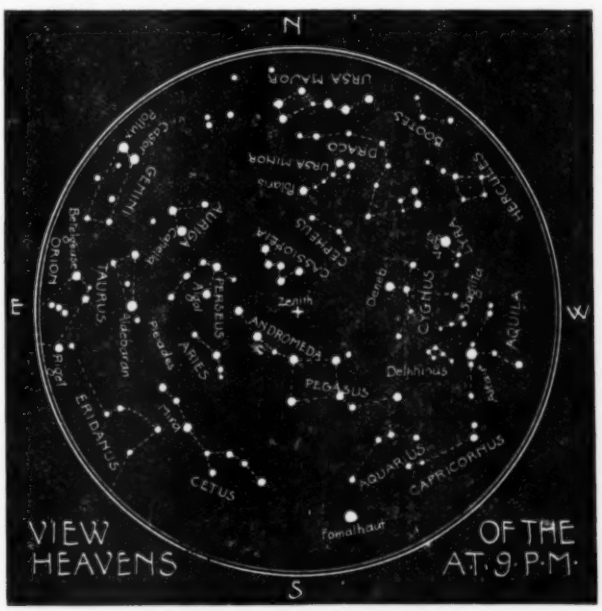
Planets.—**Venus** is still a morning star, rising in the middle of the month about three hours forty minutes before the sun. She is in the constellation Virgo, and will be seen near the moon on the 19th inst.

Mars rises on the 15th at 11.30 p.m., and crosses the meridian at twenty-two minutes past six in the morning. He is in the constellation Leo. On the 22nd he is in quadrature.

Mercury may, at the commencement of the month, be observed in the evening. He is in the constellation Scorpio, and is in inferior conjunction with the sun on the 20th inst.

Jupiter is in Ophiuchus, and sets shortly after the sun. He is therefore invisible. On the 23rd inst. he is near the moon.

Saturn is in Sagittarius, and is visible for about two hours after sunset.



STAR MAP NO. XII. (NOVEMBER).

Eclipse of the Sun.—On November 22 there is an annular eclipse of the sun, which is invisible throughout the British Isles. The student will do well to ask himself (1) why the eclipse is annular, and (2) why it is invisible in this country.

On November 1, the **length of the day** is nine hours thirty-nine minutes, which diminishes to eight hours eleven minutes by the 30th. The student should verify this statement from personal observation, and should draw a diagram accounting for the variation in question.

On November 5, the **sun's semi-diameter** is 16′ 9·9″. On the 20th inst. the semi-diameter is 16′ 13·1″. It will be advisable for the scholarship student to ask himself what this increase in apparent size betokens, especially with respect to the shape of the earth's orbit.

The **Moon** is in perigee on the 5th November, in apogee on the 17th. On the 6th inst. she is full. The meaning of perigee and apogee should be clearly explained, and the bearing of this upon the moon's orbit should at once come into the student's mind. He might also usefully draw a diagram showing the position of earth, moon, and sun when the moon is full, as she is on the 6th inst.

The **Leonids.**—The chief event of this month should be the great shower of meteorites known as the Leonids, because their radiant point is the constellation Leo—that is, they appear to come from this direction when falling towards the earth. In the years 1766, 1799, 1833, and 1866 the November displays of Leonid meteorites was grand in the extreme, and it was expected that, after the lapse of thirty-three years, another brilliant display would delight the eyes of astronomers in 1899. This expectation was doomed to disappointment, the number and brilliance of the 1899 Leonids being insignificant in the extreme. It is possible that the crowded part of the swarm may have lagged behind in the orbit, and that the critical point will be reached in the present month. On the other hand, it is believed that the swarm has spread itself out fairly equally throughout the orbit. If this be the case, no more brilliant displays are in store for us. In that case the student should be on the alert on the evenings of November 13, 14, and 15 to see this beautiful sight, should it again present itself. The proper thing to do will be to count the number of meteorites seen within a stated time—say an hour—and to carefully observe from which part of the heavens they appear to come. The position of the constellation Leo should be clearly ascertained. To do this, we may remind our readers, it is only necessary to draw a line from the Pole Star passing through the Pointers, when the reaping-hook-like shape of the front part of the constellation will be seen, and the bright first-magnitude star Regulus will fix this forward part of the lion. Two stars behind this will represent the loins of the lion; and again, behind this, in the tail, is the other first-magnitude star Denebola, of the constellation Leo. The radiant of the Leonids is the centre of the reaping-hook, just above Regulus, and it is the meteorites coming from this quarter that should be particularly noted.

And now we must, in bringing this star study to a close, take leave of our readers, some of whom we hope we have enticed to make a practice of star-gazing. To these we would say, Do not lose the habit thus formed. All the points that have been brought forward should be persistently studied until you are able with ease and certainty to make all the observations that have been recommended during the past year, and you will find fresh beauties to behold, and fresh wonders to reflect upon, as your knowledge of the heavens increases. If our readers have experienced half as much pleasure in perusing these notes as the writer has felt in inditing them, he will consider himself amply repaid.

The star maps will shortly be published by Messrs. Nelson in "*Section Two*" *Physiography*, a manual which has been specially prepared to assist scholarship students to successfully cope with the elementary science part of the Board of Education syllabus.

CHEMISTRY NOTES.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),

First Class Honoursman in Chemistry.

New Method of determining the Amount of CO_2 in Air.—Professor Letts and Mr. R. F. Blake described, at the meeting of the British Association at Bradford, a modification of Pettenkofer's method of determining the amount of CO_2 in atmospheric air. The chief points are given in the following extract from the paper read at Bradford.

A series of sealed tubes is prepared in the laboratory, each tube containing an accurately measured volume of weak potash solution (the amount of combined carbonic anhydride which such a solution always contains having been ascertained from a given stock).

The only operations which have to be performed at the place of observation are, the collection of the air sample in a suitable receiver, the transfer of the contents of one of the sealed tubes to the latter, and, after absorption of the atmospheric carbonic anhydride, their retransfer, as far as possible, to the same tube, which will again be sealed. The tubes can, of course, be kept for an indefinite period both before and after their contents have been thus treated, and the determination of the absorbed carbonic anhydride made, when convenient, with an aliquot portion of their contents. The experiments made to test the accuracy of the new method were satisfactory. Artificial mixtures of purified air and carbonic anhydride in different volumes were employed (the two being in about the proportion in which they occur in ordinary air). Five determinations in such mixtures gave a mean error of 1·3 per cent. of the carbonic anhydride taken, equivalent to four parts per million of air.

$CaSi_2$, $BaSi_2$ and $SrSi_2$ are formed when the carbonates or oxides of the alkaline earths are mixed with silica in the form of ground quartz or sand, in which the relative atomic proportions of the alkaline earth metal to the silicon in the mixture is as 1 : 2, and sufficient carbon to effect the reduction is added; or when silicates of the alkaline earth metals, in which the atomic relation of the earth metal to the silicon is as 1 : 2, are mixed with sufficient carbon to take up the oxygen of the compounds present, and heated in the electric furnace under conditions substantially like those maintained in the manufacture of alkaline earth carbides, silicides of the alkaline earth metals are produced.

The Barium Compound.—The following equations, referring to the formation of barium silicide, are typical of the rest:—

1. $BaCO_3 + 2SiO_2 + 7C = BaSi_2 + 7CO$.
2. $BaO + 2SiO_2 + 5C = BaSi_2 + 5CO$.

The silicides are bluish-white, metallic-looking substances with a crystalline fracture. They oxidise slowly in the air, more rapidly under the influence of heat, and are decomposed by water as follows:—

1. $CaSi_2 + 6H_2O = Ca(OH)_2 + 2SiO_2 + 10H$.
2. $BaSi_2 + 6H_2O = Ba(OH)_2 + 2SiO_2 + 10H$.
3. $SrSi_2 + 6H_2O = Sr(OH)_2 + 2SiO_2 + 10H$.

Silico-Acetylene (Si_2H_2).—When the calcium compound is treated with dilute acids, a new compound of the formula Si_2H_2 is produced which is the silicon analogue of acetylene, bearing the same relation to silico-methane (SiH_4) as acetylene does to methane. The reaction is as follows:—

$$CaSi_2 + 2HCl = CaCl_2 + Si_2H_2.$$

Silico-acetylene is a yellow crystalline compound. When the compound is treated with 20 per cent. of caustic soda or potash, silico-acetylene yields hydrogen according to the following equation:—

$$Si_2H_2 + 4NaOH + 2H_2O = 2Na_2SiO_3 + 10H.$$

Some experiments have been made on molten steel carrying phosphorus and sulphur, and the requisite quantity of silicide of barium or calcium completely removed these impurities, as well as all the oxygen present. The compounds were discovered and examined by Mr. C. B. Jacobs of New York.

The Universal Eudiometer.—Writing to *The Chemical News* for September 28, Mr. G. H. Woollatt describes a eudiometer which he recommends as well adapted for the simple and speedy analysis and synthesis of gases, and for demonstrations of the laws of Boyle and Charles.

It consists essentially of a U-tube, the short limb of which is jacketed, and graduated accurately in volumes, and closed at the top by a 3-way cock, the long limb being somewhat more than a metre high. In order to economise the mercury used in the experiments, the longer limb is made of narrow bore. A movable scale, graduated in tenths of inches or centimetres, slides up and down by the side of the longer limb. A pointer rod attached to the scale slides inside the jacket close to the graduations, the pointer corresponding exactly to the zero of the scale.

For measuring pressures exceeding an atmosphere, the pointer is brought to the mercury level in the eudiometer tube, and the height at which the mercury stands—as shown on the scale—in the longer limb is added to barometric pressure.

For pressures less than an atmosphere, the point r rod is raised by means of a thumbscrew until it corresponds with 10, 20, 30, or 40 cm. (as is most convenient) on the scale. This is shown by lines engraved on the pointer rod. The pointer is brought to the mercury level in the eudiometer tube as before, and the difference of levels (as read from the scale) is subtracted from barometric pressure. The apparatus is sketched in illustration of the description.

The Decomposition of Silicates by Boric Anhydride.—Herrn Jaurnasch and Weber have devised an improved method of bringing about the above decomposition. The finely-powdered material is mixed with 15 or 20 parts of Bo_2O_3. The whole is heated in a platinum crucible, first over a Bunsen burner, then over a blowpipe flame, until in tranquil fusion. After partial cooling, 5 or 6 parts more of Bo_2O_3 are added, and the whole calcined over an oxyhydrogen blowpipe until the mass is completely transparent; which operation requires about half an hour. The gas from five or six ordinary taps must be brought to the blowpipe, and the oxygen injected by means of the second tube until the flame is no longer luminous. The contents of the crucible, which should remain limpid on cooling, are taken up immediately with a mixture of HCl and methylic alcohol, and heated gently on a water bath until dry. The evaporation is repeated a second time, and with the same mixture: the expulsion of the Bo_2O_3 is very rapid. The analysis is then concluded in the ordinary manner. It is as well to note that, in the case of fluoriferous silicates, the whole of the fluorine is given off in the state of BoF_3 without any loss of silica, if care is taken to use a sufficient excess of Bo_2O_3. The method appears to be suitable in the case of fluosilicates and natural fluorides.

Estimation of Oxygen dissolved in Fresh Water, etc.—Professor Letts and Mr. R. F. Blake give the following particulars of a new method of performing the above estimation:—

An ordinary separating funnel is filled with the water, a measured volume is withdrawn, and a definite volume of standard ferrous sulphate solution is added, and afterwards ammonia, the volume of these two reagents being equal to that of the water removed. The stopper of the funnel is then inserted, care being taken that no air-bubbles are enclosed. Within the separating funnel there is now a layer of ferrous sulphate below, next the water, and, above, all the ammonia. These are mixed by inverting the vessel once or twice, when a greenish, turbid mixture results, which rapidly darkens as the dissolved oxygen is absorbed. After fifteen minutes, the vessel (still stoppered) is inverted, and its lower extremity (the tube) is nearly filled with a mixture of equal volumes of H_2SO_4 and water. The tap is then opened, when the acid flows downward into the alkaline mixture, and in the course of a few minutes dissolves the iron hydrates, forming a clear solution. This is then run off into a porcelain dish, and there titrated with either permanganate or bichromate conveniently, of the strength 1 c.c. = 1 c.c. of dissolved oxygen at normal pressure and temperature.

In the author's experiment, the separating funnel used had a capacity of 332·5 c.c., and its tube contained, when nearly full, altogether 8 c.c. of diluted H_2SO_4. Altogether, 7 c.c. of the water was removed, 5 c.c. of standard ferrous sulphate was added, and altogether 2 c.c. of strong ammonia. The ferrous sulphate solution contained altogether 12 grains of the crystallised salt to 250 c.c. of distilled water. It was standardised for each determination by titrating 5 c.c. in a porcelain basin, mixed with the same volume of the water under examination as was employed in the dissolved oxygen determination, and the same volume of acid.

DRAWING FOR SCHOLARSHIP EXAMINATION.

With many Illustrations.

See November Number of

THE PRACTICAL TEACHER'S ART MONTHLY.

Now ready. Price Twopence.

NOTES ON ADVANCED AND HONOURS PHYSIOGRAPHY.

Swift's Comet.—During the months of March and April 1892, this comet was under the observation of Professor Pickering, the great American astronomer, who supplies the following particulars concerning it:—While the comet was easily visible to the naked eye, it was carefully examined with a double-image prism, but no traces of polarisation could be detected in either the head or the tail. The nucleus was yellowish-green in colour, giving out a triangular jet towards the sun. The head was distinctly divisible into three parts—nucleus, bright primary envelope, and an outer fainter one. The tail was composed of two sets of rays having distinctly different origins. The brighter of these sets, forming what may be called the "inner" tail, took its origin from the rear side of the inner envelope, and in some photographs this attains the great length of over 20° of arc. The rays were absolutely straight, so far as could be determined from the photographs, and were inclined to each other about 10°. The outer tail sprang from the external faint envelope, and, in contrast to the other, was marked by conspicuous deep and wide rifts between the rays composing it.

On April 6, 7, 8, a bright condensation was noticed each day, and its distance from the nucleus of the comet was found to increase day by day. These displacements were carefully measured, converted into kilometres by reference to the comet's elements, and an estimate made of the amount of repulsive force exerted upon the comet's tail by the sun. This indicated the total repulsive force to be about 39·5 times the gravitational force. The brightest region of the spectrum appears to have been an intense and very narrow line about 389°. No indications of the hydrogen line were seen.

The Earth's Nucleus.—The majority of geologists have long hankered after a metallic nucleus for the earth, composed chiefly, by analogy with meteorites, of iron. Lord Kelvin has admitted the probable existence of some nucleus, and, lately, Professor Wiechert has furnished us with arguments in support of its existence. The interior of the earth for four-fifths of the radius is composed, according to Professor Wiechert, chiefly of metallic iron, with a density of 8·2; the outer envelope, one-fifth of the radius, or about 400 miles in thickness, consists of silicates, such as we are familiar with in igneous rocks and meteorites, and possesses a density of 3·2. It was from this outer envelope, when molten, that the moon was trundled off, 27 miles in depth going to its formation. The density of this material, as we have just seen, is supposed to be 3·2; the density of the moon is 3·39, a close approximation, such difference as exists being completely explicable by the comparatively low temperature of the moon.

The Moon a Charged Bomb.—The outer envelope of the earth, which was drawn off to form the moon, was charged with steam and other gases under a pressure of 5,000 lbs. to the square inch; but as the satellite wandered away from the parent planet, this pressure continuously diminished. Under these circumstances, the moon would become as explosive as a charged bomb; steam would burst forth from numberless volcanoes; and while the face of the moon might thus have acquired its existing features, the ejected material might possibly have been shot so far away from its origin as to have acquired an independent orbit. If so, we may ask, may it not be possible that the meteorites which sometimes descend upon our planet are but portions of its own envelope returning to it? The facts that the average specific gravity of these meteorites which have been seen to fall is not much above 3·2, and that they have passed through a stage of fusion, are consistent with this suggestion.

Second Critical or Solidification Period.—The solidification of the earth probably became completed soon after the birth of the moon. The temperature of its surface at the time of solidification was about 1170° C., and it was therefore still surrounded by the primitive deep atmosphere of steam and other gases. This second period, Lord Kelvin thinks, lies between twenty and forty million years ago—probably nearer twenty than forty. Now that the crust was solid, there was less reason why the movements of the atmosphere should be unsteady, and definite regions of high and low pressure might have been established. Upon the high-pressure areas the surface of the crust would be depressed; under the low-pressure areas it would be raised: thus from the first the surface of the solid earth might have been dimpled or embossed.

Third Critical Period—Origin of the Oceans.—The cooling of the earth would continuously progress till the temperature of the surface fell back to 370° C., when that part of the atmosphere which consisted of steam would begin to liquefy; then the dimples on the surface would soon become filled with superheated water, and the pools so formed would expand and deepen until they formed the oceans.

How the Oceans Grew.—The average pressure of the primitive atmosphere upon the crust of the earth, in virtue of which the crust was kept solid, although above the temperature of liquefaction, was equal to the average depth of the ocean if spread equally over the whole earth, which is 1·718 miles. Supposing that at its origin the ocean was "all gathered in one place," and "the dry land appeared," then the pressure over the ocean floor would be increased to 2·393 miles, the average depth of the ocean. Those portions of the surface that formed the dry land would thus have their pressure diminished by 1·718 miles. Under these circumstances, the pressure of the ocean would be just able to support a column of rock 0·886 miles in height, or $\frac{5}{12}$ths of its own depth. It could do no more. But in order that the dry land may appear, some cause must be found competent either to lower the ocean bed the remaining $\frac{7}{12}$ths, or to raise the continental bulgings to the same extent. Such a cause may, I think, be discovered in a further reduction in pressure over the continental areas. Previous to the condensation of the ocean, these were subjected to an atmospheric pressure equal to that of a column of water 1·718 miles in height. This pressure was contributory to that which caused the outer 25 miles of the earth's crust to become solid; it furnished, indeed, just $\frac{1}{14}$th of that pressure, or enough to raise the fusion point 6° C. What, then, might be expected to happen when the continental area was thus relieved? Plainly, a liquefaction and corresponding expansion of the underlying rock. Without any liquefaction there would still be sufficient expansion to account for the raising of the land the additional $\frac{5}{12}$ths required to bring it to the sea-level, from the fact that when matter, at a temperature above its ordinary fusion point, is compelled into the solid form by pressure, its volume is very responsive to changes either of pressure or of temperature. How far down beneath the surface the unloading of the continents would be felt, it is difficult to say; but if it affected an outer envelope 25 miles in thickness, a linear expansion of four per cent. would suffice to explain the origin of ocean basins.

MATHEMATICS.

STAGES 2 AND 3, BOARD OF EDUCATION, SOUTH KENSINGTON.

BY G. A. BAXANDALL,

Assistant, Mathematical Division, Royal College of Science, London.

Stage 2.

Algebra.

Quadratic Equations.—Read Hall and Knight, chap. xxv.; C. Smith, chaps. xiv. and xv.; Todhunter and Loney, chaps. xxii. and xxiii.

The more important articles are: in Hall and Knight, 195*, 201, 202; in C. Smith, 134, 137, 138*, 144, 147; in Todhunter and Loney, 227*, 232, 235, 242.

A student should aim at being able to apply the general rule (given in those articles marked above with an asterisk) to any quadratic equation—not only to such as contain simple whole numbers which have been specially arranged, but to equations such as

$$\cdot 045x^2 - 2\cdot 18x = \cdot 429.$$

After a little practice, one realises that the rule itself is very easy to apply, but that great care is necessary in carrying out the operations of addition, subtraction, multiplication, division, square root, etc., in order to obtain correct answers.

Having learned the general rule, and having observed the general *form* of a quadratic equation, a student should realise that equations like

$$4x^2 - 5x - 9 = 0,$$
$$4x^4 - 5x^2 - 9 = 0, \text{ or } 4(x^2)^2 - 5x^2 - 9 = 0,$$
$$4(x^2 - x)^2 - 5(x^2 - x) - 9 = 0,$$
$$4(x + y)^2 - 5(x + y) - 9 = 0,$$

are all worked out *in the same way*—the result of applying the general rule being that we find the values of x, x^2, $x^2 - x$, and $x + y$ respectively.

Work out examples selected from the sets provided in the above chapters, and also from the chapter which deals with problems leading to quadratics.

Also work the following:—

1. Solve the equations—

(*a*) $\frac{4x}{x-1} - \frac{19}{2x^2-2} = \frac{10}{x+1}$. (1900, Day.)

(*b*) $\frac{7}{x+3} + \frac{27}{x^2-9} = \frac{6x}{4x-12}$. (1900.)

(*c*) $4xy = b^2$, $x + z = 2a$, $y + z = a$. (1900.)

(*d*) $0{\cdot}35x^2 - 5{\cdot}23x - 7{\cdot}86 = 0$.

Ans. (*a*) $\frac{\pm\sqrt{7}+3}{4}$; (*b*) 3 or $-\frac{4}{3}$; (*c*) $x = \frac{a+d}{2}$, $y = \frac{d-a}{2}$, $z = \frac{3a-d}{2}$, or $x = \frac{a-d}{2}$, $y = -\frac{a+d}{2}$, $z = \frac{3a+d}{2}$, where d stands for $\sqrt{a^2+b^2}$; (*d*) 16·32, or − 1·37.

2. The area of a rectangle is 108 square feet; by lines parallel to the shorter sides three squares are cut off, and it is found that the length of the remainder of one of the longer sides is 10·5 feet. Find the lengths of the sides of the rectangle before the squares are cut off. (1900.) Ans. 4½ feet, 24 feet.

3. A number of men are first formed into a solid square, and afterwards into a hollow square four deep; the front presented in the latter formation has a hundred men more than the front in the solid square. Find the number of men. (1900.)

Ans. 2304.

Trigonometry.

At this stage the student is expected to know thoroughly well—

1. That there are 57·29 or $\frac{180}{\pi}$ degrees in one radian, and hence when an angle is expressed in degrees, it can easily be expressed in radians, or *vice versâ*.
2. The definitions of the six trigonometrical ratios.
3. That having given the numerical value of one of these ratios is the same as having given two sides of a right-angled triangle; hence, since the other side can be found by I. 47, the values of all the other ratios can be written down.

Since the six trigonometrical ratios are defined in terms of two sides of a right-angled triangle, and these sides are not independent of each other, but are connected by the relation

$$(\text{base})^2 + (\text{height})^2 = (\text{hypotenuse})^2,$$

it follows that the ratios are not independent of each other, but are connected by certain relations. These relations are very important, and there is no way of becoming really familiar with them except by working a very large number of examples known as "identities."

Read chap. iii., Hall and Knight; chap. vii., Lock; chap. ix., Hamblin Smith; Arts. 27 to 30, Loney.

Work examples selected from the sets of "identities" given in the above articles and chapters. The student who wishes to do his trigonometry thoroughly should work every example in the text-book which takes the form of an "identity."

In this part of the subject a student cannot receive much real help from a text-book. He may be reminded that sin A, cos A, tan A, etc., represent numbers like the a, b, c, x, y, z of algebra, and he must be ready to resolve into factors any expressions which contain them, to add and subtract, multiply and divide as in algebra. In fact, the work consists mainly of applying the ordinary rules of algebra, the only trigonometrical part consisting of using the relations

$\sin^2 A + \cos^2 A = 1$, or $1 - \sin^2 A = \cos^2 A$, $1 - \cos^2 A = \sin^2 A$,

$$\tan A = \frac{\sin A}{\cos A}, \quad \cot A = \frac{\cos A}{\sin A},$$

$$\sec A = \frac{1}{\cos A}, \quad \operatorname{cosec} A = \frac{1}{\sin A}.$$

Example.—Using the mathematical tables, take A = 25° or 66°, illustrate the truth of the above relations—that is, show by actual multiplication, etc., that

$\sin^2 25° + \cos^2 25° = 1$, and so on.

Geometry.

Work the following Exercises on Book II.:—

1. Enunciate the proposition which corresponds to the formula $(a + b)^2 + b^2 = a^2 + 2b(a + b)$.
2. A straight line, AB, is bisected in C. Show how to find a point D in AB produced such that the rectangle contained by AD, DB may be equal to the square on BC.
3. Show how to describe a right-angled triangle such that the rectangle contained by the hypotenuse and one of the other sides may be equal to the square on the third side.

Stage 3.

Algebra.

Progressions.—Read the following: Hall and Knight, chaps. iv., v., vi.; Todhunter and Loney, chaps. xxxv., xxxvi., xxxvii.; C. Smith, chap. xvii.; Briggs and Bryan, *Intermediate Algebra*, chaps. xiv. and xv.

The following are the main points which require attention:—(1) An expression for the rth term of an arithmetic, geometric, or harmonic series; (2) the expressions for the arithmetic, geometric, and harmonic mean between two terms, or for any number of means between two given terms; (3) expressions for the sum of an A.P. or G.P. to n terms, or of a G.P. to infinity.

The student should, time after time, establish these expressions from first principles, rather than commit the expressions to memory.

One particular form of series, and the artifice adopted for finding the sum of n terms of such a series, should be specially noticed—namely, the series in Hall and Knight, Art. 60; Todhunter and Loney, Art. 429; Briggs and Bryan, Arts. 221, 222.

Work examples from the sets given in the text-books; also the following:—

1. If S_r be the sum of the series formed by taking the first term, the $(r + 1)$th term, the $(2r + 1)$th term, and so on, of a geometric series having unity for its first term, and its sum to infinity finite, prove that $S_m^n(S_m - 1)^n = S_n^m(S_n - 1)^m$.

(For solution, see Query Column, Practical Teacher, February 1899.)

2. If a, b, c, d be four unequal quantities in arithmetical progression, and $a^2 + b^2$, $b^2 + c^2$, $c^2 + d^2$ be in geometrical progression, then will $b^2 - 4bc + c^2 = 0$.

(For solution see Query Column, Practical Teacher, February 1899.)

3. The sum of four numbers in G.P. is 15; the sum of their squares is 85. Find the numbers. Ans. 1, 2, 4, 8.

(For solution, see Query Column, Practical Teacher, March 1899.)

4. Find the sum of n terms of the series the rth term of which is $(2r + 1)2^r$. Ans. $2 + 2^{n+1} - n2^{n+2}$.

(For solution, see Query Column, Practical Teacher, April 1900.)

5. If x, y, a be in A.P.,
x, y, b be in G.P.,
x, y, c be in H.P.,
show that
$b(c - a)^2 = 4c(b - a)(c - b)$.

(For solution, see Query Column, Practical Teacher, November 1900.)

Trigonometry.

Further practice is necessary in working examples on the formulæ for finding the sine, cosine, and tangent of the sum and difference of two angles, and of the multiples and submultiples of an angle.

In the text-books there is quite a large number of exercises on these formulæ, and the student may be a little perplexed as to how many or which he should work. As a guide in making such a selection, he must keep in view the main object, which is, to be able to *readily* convert the sum or difference of two sines or cosines into the product of two sines, two cosines, or a sine and a cosine, as the case may be; or *vice versâ*.

The proofs by projection of some of these formulæ as given in Hall and Knight, chap. xxii., should be studied.

By means of these formulæ the sine, cosine, and tangent of such angles as 9°, 15°, 18°, 22½°, 36°, 54°, 67½°, 72°, 81°, etc., can be easily determined. (See Hall and Knight, Arts. 126, 251, 260; Loney, Arts. 120, 121, 123.)

Work the following:—

1. Show that $\cos(36° - A) + \cos(36° + A) - (\cos 72° - A) - \cos(72° + A) = \cos A$. (1900.)
2. Find the tangent of the angle subtended at the centre of a circle by a chord which is half as long as the radius. (1900.)

Ans. 8/15.

3. If $\cos\beta \tan x = \sin\alpha$, show that $\cos(\alpha - \beta)\cos(\alpha + \beta)\tan 2x = \sin(\alpha - \beta) + \sin(\alpha + \beta)$. (1899.)
4. D is the middle point of the hypotenuse, AB, of a right-angled triangle, ABC. Draw CE at right angles to AB. Show that DE tan 2A = AE tan A, and hence find geometrically tan 2A in terms of tan A.

RALPH, HOLLAND, & CO.'S PUBLICATIONS

The Best possible Books for P.T., Scholarship, and Certificate Examinations.

Clough's Certificate History.

(1789–1815.)

With Coloured Maps, Plans, and full Summaries of Important Events.

Crown 8vo, 272 pages, well bound in cloth, **3s. 6d.**

The only book in the Market specially written for this Examination.

Special Appendices cover Irish affairs, the Literature of the Period, the Industrial History of the Period, and the Treaty Changes in the Map of Europe.

The Historical Geography of Europe has been treated in special detail throughout, and all Territorial Changes are illustrated by Maps.

NO CERTIFICATE STUDENT CAN AFFORD TO DO WITHOUT THIS BOOK.

HELPS TO THE STUDY OF

Scott's "Marmion." (Canto VI.)

By T. E. Margerison, M.A. (Lond.), Principal of the Tottenham P.T. Centre. **Price 1s.**

HELPS TO THE STUDY OF

Goldsmith's "The Traveller."

By M. Gompertz, B.A., Principal, P.T. Centre, Leyton. **Price 1s.**

HELPS TO THE STUDY OF

Shakespeare's "Julius Cæsar."

By R. Rutherford, Winner of the *Tit-Bits* £1,000 Literary Prize. **1s. 6d.**

Clough's Expansion of the British Empire.

(1558-1858)

The Period specially prescribed for Candidates for the Queen's Scholarship Examination, December 1900. **Price 1s. 6d.**

HELPS TO THE STUDY OF

Coppée's Le Trésor,

The French Author for Scholarship, 1900. By Alfred Barriball, B.A., Lecturer in French at the Westminster College. **Price 1s. 6d.**

Clough's Reprint of Scholarship Questions (1889-1899 inclusive), with Government Instructions, and Answers to Arithmetic and Algebra. Invaluable to every Scholarship Candidate. **Price 1s. 6d.**

Algebraic Factors.

By Ernest Rush, Principal of Worcester Pupil Teachers' Centre, and late Teacher of Mathematics at Reading College. **Price 2d.**, post free **3d.**

Logic and Education.

By the Rev. J. Lightfoot, M.A., D.Sc.; First Honours, Mental and Moral Science. **Price 1s. 6d.**

Ethics and Education.

By T. E. Margerison, M.A. (Lond.), Licentiate and Prizeman of the College of Preceptors. **Price 1s. 6d.**

Psychology and Education.

By T. E. Margerison, M.A. (Lond.), Licentiate and Prizeman of the College of Preceptors, Author of "Ethics and Education." **Price 1s. 6d.**

The Essentials of French Grammar.

By Alfred Barriball, B.A., Lecturer in French at the Westminster College. **Price 2s. 6d.**

Science Note-Books.

By J. H. Nancarrow, late Head-master Kingston Public School of Science, and Lecturer in Hygiene and Physiography at the Richmond School of Science.

PHYSIOGRAPHY	Elementary (New, Revised, and Enlarged Edition)	1s.
	Advanced (New, Revised, and Enlarged Ed.)	1s.
HYGIENE	Elementary	6d.
	Advanced	9d.

IMPORTANT TO SCHOLARSHIP STUDENTS.

Clough's Reign of Elizabeth, Barriball's Helps to the Study of Le Trésor, and Ralph's Physiography Note-Book were used by Mr. W. Craig, who secured the FIRST PLACE on the Scholarship List published March 1900.

To be obtained through all Booksellers, or post free at published price from

RALPH, HOLLAND, & CO., Educational Publishers,

69 Temple Chambers, LONDON, E.C.

NOTES ON THEORETICAL MECHANICS.

BY F. CASTLE, M.I.M.E.,

Royal College of Science; Lecturer on Mechanics, Geometry, etc., Morley College, London; Author of "Elementary Practical Physics," etc.

ADVANCED AND HONOURS STAGES.

Angular Velocity.—A body moving in a straight line is said to move with uniform velocity when equal spaces are described in equal times; if the motion takes place about a fixed centre, then uniform velocity denotes equal angles described in equal times.

If a point P move with uniform velocity V in a circle of radius R, by means of the relation $V = w\mathrm{R}$ the angular velocity w can be obtained when V and R are known.

As $w = \dfrac{\mathrm{V}}{\mathrm{R}}$, to obtain the numerical magnitude of the unit angle we must have V = R. Or, the unit angle (one *radian*) is the angle subtended at the centre of a circle by an arc equal in length to the radius. In any circle we have the relation—

$$\frac{\text{length of arc}}{\text{circumference of circle}} = \frac{\text{angle subtended}}{360^\circ}.$$

$$\therefore \text{angle} = \frac{\text{length of arc} \times 360^\circ}{\text{circumference}}$$

$$= \frac{\mathrm{R} \times 360^\circ}{2\pi\mathrm{R}} = \frac{180}{\pi} = 57{\cdot}3^\circ \text{ approximately.}$$

When a body of mass M is moving in a straight line with velocity V, as all parts of the body may be assumed to have the same velocity, the kinetic energy is given by $\frac{1}{2}\mathrm{MV}^2$. When this formula is applied to the case of a body moving round a fixed centre, the assumption is made that the mass of the body is collected at a point moving with velocity V.

To obtain a general formula, we may use the relation $V = w\mathrm{R}$, and substitute for V in $\frac{1}{2}\mathrm{MV}^2$. This becomes $\frac{1}{2}\mathrm{M}w^2\mathrm{R}^2$. Thus the kinetic energy of a particle of mass M_1 at a distance R_1 from the centre would be $\frac{1}{2}\mathrm{M}_1w^2\mathrm{R}_1^2$.

A similar expression for any number of particles of masses M_2, M_3....., etc., and at distances R_2, R_3....., etc., from the centre, would be obtained. The sum of all such particles may be conveniently denoted by the summation symbol Σ.

Thus kinetic energy $= \frac{1}{2}w^2\Sigma(\mathrm{M}_1\mathrm{R}_1^2 + \mathrm{M}_2\mathrm{R}_2^2 + \ldots\ldots)$. The quantity under the summation symbol, denoting the mass of each particle of a body multiplied by the square of its distance from a given axis, is called the moment of inertia about that axis, and is denoted by the symbol I. Hence the kinetic energy of a rotating body may be written $\frac{1}{2}w^2\mathrm{I}$.

The numerical value of I is tabulated, or can readily be obtained by calculation. Thus the value of I for a rod of uniform density, with reference to an axis passing through one end at right angles to its length, is $\frac{1}{3}ml^2$, where m is the mass of the rod, and l its length. When w and l are known, the kinetic energy can be obtained.

The moment of inertia of a circular lamina about an axis at right angles to its plane, and passing through its centre, is $\frac{1}{2}\mathrm{M}r^2$, where M is the mass, and r the radius of the lamina.

Ex. 1. A rod 6 feet long, weighing 12 lbs., revolves uniformly 30 times a minute about an axis at right angles to its length, and passing through one end. Find its kinetic energy. (1887.)

$$\text{Here } \mathrm{I} = \tfrac{1}{3} \times 12 \times 6^2 = 144.$$

$$w = \frac{2\pi \times 30}{60} = \pi.$$

$$\therefore \text{kinetic energy} = \tfrac{1}{2}w^2\mathrm{I} = \tfrac{1}{2}\pi^2 \times 144 = \underline{72\pi^2}.$$

Ex. 2. The diameter of a circular lamina is $3\frac{1}{2}$ feet, its mass 100 lbs.; it turns round a fixed axis 120 times a minute. Find its kinetic energy (*a*) in foot poundals, (*b*) in foot pounds. ($\pi = 3\frac{1}{7}$, $g = 32$.) (1889.)

$$\text{Here } w = \frac{2\pi \times 120}{60} = 4\pi.$$

$$\mathrm{I} = \tfrac{1}{2}\mathrm{M}r^2 = \tfrac{1}{2} \times 100 \times \left(\frac{7}{4}\right)^2$$

$$= \frac{50 \times 49}{16}.$$

$$(a)\ \text{Kinetic energy} = \tfrac{1}{2}\mathrm{I}w^2 = \tfrac{1}{2} \times \frac{50 \times 49}{16} \times 16\pi^2$$

$$= \underline{12100 \text{ foot poundals.}}$$

Dividing by 32, we obtain $\underline{378{\cdot}125 \text{ foot lbs.}}$

Ex. 3. A particle whose mass is 3 lbs. moves uniformly in a circle; it describes the circumference 42 times a minute. Find its angular velocity about the centre; and if the radius is 14 feet, find its kinetic energy. (1893.)

During each revolution the particle describes 2π radians, and, therefore, $2\pi \times 42$ radians in 42 revolutions.

$$\therefore w = \frac{42 \times 2\pi}{60} \text{ radians.}$$

The velocity of the body is $\dfrac{2\pi \times 14 \times 42}{60} = \dfrac{98\pi}{5}$.

$$\text{Kinetic energy} = \tfrac{1}{2} \times 3 \times \left(\frac{98\pi}{5}\right)^2 = 5691{\cdot}81 \text{ foot poundals.}$$

Units of Force.—The two units of force which are important in this subject are the *poundal* and the *dyne*. The poundal is that force which, when applied to unit mass (1 lb.), generates a velocity of one foot per second. The *dyne* is the force which, applied to a mass of one gram, generates a velocity of one centimetre per second. To ascertain the relation of one unit to the other, it is only necessary to remember that 1 lb. = 453·7 grams, and 1 foot = 30·48 centimetres. Hence the momentum generated by a poundal in one second = 453·7 × 30·48 = 13780.

∴ one poundal = 13780 dynes nearly.

Work.—Whenever a force acting upon a body causes motion or modifies the motion of a moving body, either as an acceleration or a retardation, the force is said to do work. It should be carefully noted that, however great the force may be, no work is done unless motion is produced or altered.

To raise a weight of 28 lbs. to a height of 10 feet would require 10 × 28 = 280 foot lbs. of work; but no additional work is done so long as the weight is kept at a distance of 10 feet from the ground. If placed on a shelf, no work is done by the shelf in merely supporting the weight.

Whilst the body is in this position, it is said to have *potential energy*. If allowed to fall (neglecting the resistance of the air), the potential energy gradually disappears, and is replaced by kinetic energy, until, at the instant the body touches the ground, the potential energy becomes kinetic energy of a like amount. A good illustration of this interchange is furnished by a pendulum. When this is at rest in its lowest position, we may consider that it possesses no store either of potential or kinetic energy; when displaced from its mean position, its potential energy is due to the height to which it has been raised. If allowed to swing, a conversion of potential to kinetic energy takes place, until, at the instant when it passes its lowest position, the whole of the potential is transformed into kinetic energy, and this, again, becomes potential as the pendulum rises on the opposite side.

Problems on work, energy, and momentum are very important, and exercises on these should be carefully worked until their manipulation becomes an easy matter.

In problems on work, it is sometimes advisable to draw a diagram of work done. This is usually a simple matter. Thus, suppose a chain 20 feet in length, and weighing 10 lbs. per foot length, be raised to a height of 10 feet; then, as the total weight of the chain is 200 lbs., the work done would be 200 × 10 = 2000 foot lbs.; and the diagram of work would simply consist of a rectangle, one side equal to 200 units on any convenient scale, and the other equal to 10 units on the same scale. The area of the rectangle represents the work done.

When the chain is hanging by one end, to find the work required to raise the lower end to meet the upper.

We notice that the centre of gravity of the lower half of the chain is raised a distance of 10 feet, and as the lower half weighs 100 lbs., the work done will be 100 × 10 = 1000 lbs.; or it may be represented by the area of a triangle, base 200, height 10.

Ex. 1. A shaft 560 feet deep and 5 feet in diameter is full of water. How many foot lbs. of work are required to empty it, and how long would it take an engine of $3\frac{1}{2}$ horse-power to do the work? ($\pi = 3\frac{1}{7}$.) (1887.)

$$\text{Volume of water in shaft} = \frac{560 \times 25 \times 22}{4 \times 7} \text{ cubic feet}$$

$$= 11000 \text{ cubic feet.}$$

Assuming a cubic foot of water to weigh $62\frac{1}{2}$ lbs.

Then total weight of water = 11000 × $62\frac{1}{2}$ lbs.

This weight is raised through a mean distance of 280 feet.

$$\therefore \text{Work done} = 11000 \times 62\tfrac{1}{2} \times 280 = 192500000 \text{ foot lbs.}$$

$$\text{Time required} = \frac{192500000}{3\frac{1}{2} \times 33000} = \frac{5000}{3}$$

$$= \underline{1666{\cdot}6 \text{ minutes.}}$$

ALLMAN & SON, Ltd.

JUST PUBLISHED.

PRACTICAL Book-keeping.

By W. D. OLDHAM, Chartered Accountant, & W. E. HOLLAND, Incorporated Accountant,
Instructor of Book-keeping at the Borough of West Ham Municipal Technical Institute.

Price **2/-** crown 8vo, cloth.

SPECIMEN COPIES to Head-masters at half-price.

Exercise Books arranged for use with above, together with Illustrative Sheet, 2s. set.

The Old Testament History.

FOR YOUNG STUDENTS. [*2nd Edition.*

By Rev. C. J. HAMER, Vicar of St. Paul's, Newcastle-upon-Tyne.

With a Preface by THE LORD BISHOP OF RIPON.

THE FOLLOWING ARE THE CHIEF FEATURES:—

A. The Language is *simple*, but not *childish*.
B. The Words of Scripture are placed within inverted commas.
C. The meanings of the names of persons and places are given in italics.
D. The names of persons and places, etc., to be remembered are impressed on the mind by the use of dark type.
E. Important variations between the Authorised and Revised Versions are put in italics.
F. References are given to show the connection of the history with events, persons, and places previously mentioned.

Price **1/-** crown 8vo, cloth.

Literature.—"Simply told, and seems well suited to its purpose."

SPECIMEN post free to Principals and Head-masters.

QUESTIONS on "Henry V."

By JOHN LEES, B.A. Lond. (Eng. Hons.), Assistant Master, Aske's Hatcham School.

Price **2/6** cloth. Interleaved with Plain Paper.

Extracts from Reviews of Mr. Lees' "Questions on 'As You Like it.'"

Literature.—"For a critical and detailed study of the play, scene by scene, this book is very useful, not only for examination purposes, but as a guide to teachers."
Practical Teacher.—"It would probably be difficult to set a question on this play which Mr. Lees has not in some way anticipated."

CHEMISTRY for Examinations.

By H. W. HILL, First Class Honours London Inter. B.Sc., and qualified for the Exhibition.

Price **2/6** crown 8vo, cloth.

"Designed chiefly to supplement the ordinary text-book."
Scotsman. "A useful book for students, especially for those working for the Oxford and Cambridge Locals."

SPECIMEN COPY post free on receipt of 2/1 in stamps.

EUCLID, Books I. and II.

By TELFORD VARLEY, M.A., B.Sc.,
Ninth Wrangler; Sometime Scholar of St. John's College, Cambridge, and Scholar of University of London; Head-master of Peter Symond's School, Winchester.

Price **1/-** crown 8vo, cloth.

Literature.—"The book certainly gives lucidity to the reasoning by its very clear arrangement."
Scotsman.—"Lucid exposition. Numerous equipment of illustrative exercises."
Practical Teacher.—"The alternate proofs—for example, that to Prop. 5—are clever, and the explanations and arrangement throughout are all that could be desired."
Guardian.—"In clearness of statement it is, perhaps, more suggestive to the beginner than any other."

COMPLETE CATALOGUE FOR 1900 FORWARDED ON APPLICATION.

London: ALLMAN & SON, Ltd., 67 New Oxford Street, W.C.

ELECTRICITY AND MAGNETISM.

NOTES ON ADVANCED AND HONOURS STAGE.

BY EDWIN EDSER, A.R.C.S., F.PH.S.

In last month's article the term "difference of potential" was defined in terms of the mechanical equivalent of the heat produced in a wire by the passage of an electric current. But work may be performed by an electric current in other ways than in the direct production of heat in a uniform wire. Thus, chemical changes may be produced, or parts of the circuit may be set in motion; further, if the current traverses a junction of two different metals, heat may be produced in a manner entirely different from that in which a uniform conducting wire is heated by the passage of a current. But in any case where work is performed a difference of potential will result. The most general definition of the difference of potential between two points in a circuit will now stand as *the work performed per second between the points in question, divided by the current strength.*

Chemical Work.—Let us suppose that an electric current (of strength C) passes through a cell provided with platinum electrodes dipping into water acidulated with sulphuric acid. It is required to determine, to a first approximation, the difference of potential between the electrodes. (In what follows, difference of potential, current, and resistance are measured in C.G.S. units, except where other units are expressly mentioned.)

In this case the work performed may be divided into two parts.

1. *Work done in heating the liquid.*—Let R be the resistance of the acidulated water forming the path of the current between the electrodes. Then the current, C, will produce an amount of heat per second equivalent to the work performed per second. The work performed per second = C^2R. The corresponding difference of potential is equal to CR.

2. *Work performed in decomposing water.*—It is known that for each C.G.S. unit of current passing through acidulated water, ·000105 gram of hydrogen will be liberated per second at the cathode (the electrode at which the current leaves the cell), and $\frac{16}{2} \times$ ·000105 (= ·000840) gram of oxygen will be liberated per second at the anode (the electrode at which the current enters the cell).

It is also known that if 1 gram of hydrogen combines with its chemical equivalent (that is, $\frac{16}{2}$ = 8 grams) of oxygen, then the heat produced would raise the temperature of 34,000 grams of water through 1° C. In other words, 34,000 heat units are produced under these circumstances. This is equivalent to 34,000 $\times$ 42 $\times$ 10^6 ergs, since 1 heat unit is equivalent to 42 $\times$ 10^6 ergs (Joule's equivalent). Hence, since an amount of heat equivalent to 34 $\times$ 10^3 $\times$ 42 $\times$ 10^6 (= 1·43 $\times$ 10^{12}) ergs is produced when 1 gram of hydrogen combines with its chemical equivalent of oxygen, we may conclude that in order to decompose an amount of water sufficient to produce 1 gram of hydrogen, we must perform an amount of work equal to 1·43 $\times$ 10^{12} ergs.

But for each ampère passing through the acidulated water, ·000105 gram of hydrogen is liberated per second. The equivalent amount of work is obviously equal to

$$1{\cdot}05 \times 10^{-4} \times 1{\cdot}43 \times 10^{12} = 1{\cdot}47 \times 10^{8} \text{ ergs.}$$

Since P.D. = $\frac{\text{work performed per second}}{\text{current strength}}$, we find that the difference of potential due to the decomposition of the water is equal to 1·47 $\times$ 10^8 C.G.S. units, or 1·47 volts.

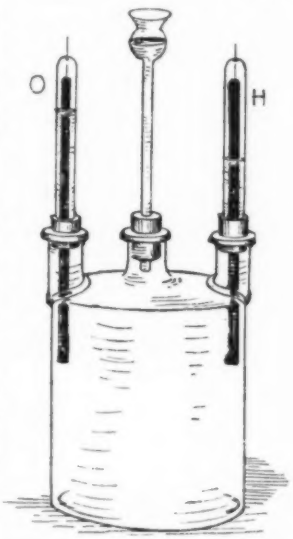
Hence, in sending a current C (in C.G.S. units) through the cell, the difference of potential, E, between the terminals will be, to a first approximation,

$$E = 1{\cdot}47 \times 10^{8} + CR.$$

This agrees roughly with the results of experiments. It is found that in order to cause an electric current to pass through a cell with platinum electrodes, filled with a "normal" solution of sulphuric acid (that is, a solution containing 1 gram of hydrogen combined to form H_2SO_4 per litre of the solution), the smallest possible difference of potential is 1·67 volts. In this case the value of C is negligibly small (since only the smallest current is supposed to pass through the battery), so that CR is negligible.

The above reasoning should explain the production of a fall of potential at a point in a circuit where chemical work is performed. The agreement of the calculated results with experiment is not of a very close order of accuracy, but it must be remembered that we have assumed that the whole of the chemical work performed is due only to the energy introduced by the current. In reversible cells (that is, cells in which each action in the process is reversed when the current is reversed) it is possible for heat to be absorbed directly and converted into electrical energy, or, conversely, for electrical energy to be converted into heat, in a manner which is independent of the resistance of the cell. As far as these processes are concerned, the cell becomes equivalent to a heat engine. There are also a number of modifying circumstances which as yet are only imperfectly understood. Thus, an alteration in the cathode from platinum to carbon makes an appreciable difference in the smallest terminal P.D. which will suffice to force a current through the cell.

We have examined the case in which an electric current is used to decompose water into its constituent gases, oxygen and hydrogen. The energy set free when oxygen and hydrogen combine to form water may, under certain circumstances, be utilised in the production of an electric current. The arrangement is known as Grove's gas battery. This consists (Fig. 1) of a three-necked Woulff's bottle, the middle neck being provided with a cork into which the stem of a funnel fits, whilst the side necks are fitted with tubes sealed at their upper ends round platinum wires. These wires are welded on to strips of platinum which are afterwards covered with platinum black. (The platinum black can best be deposited by making the strip of platinum the cathode in a small cell containing a solution of platinic chloride with a small amount of lead acetate added, and passing a current from a suitable battery through this cell.)



To start with, the Woulff's bottle and its side tubes are filled with acidulated water, and an electric current is passed from one platinum electrode to the other. Hydrogen is liberated, and collects in the side tube containing the cathode, and oxygen is liberated in the anode tube. Thus a part of each electrode becomes exposed to the gas liberated at that electrode. After suitable amounts of the gases have been collected in the tubes, the electrolysing current may be stopped, and the connections with the source of current removed. If now the terminals of the Grove's gas battery be connected with the terminals of a high-resistance galvanometer, it will be found that an electric current leaves the battery at the terminal connected with the tube containing oxygen, and enters the battery at the other terminal. It will also be noticed that, as the current continues, the volumes of the liberated gases decrease, until finally the side tubes will become once more full of acidulated water.

The P.D. between the terminals of a Grove's gas battery, when only an infinitesimal current is being produced, is equal to 1·67 volts; this value is equal to the smallest terminal P.D. which can be used to decompose acidulated water.

The explanation of the action of Grove's gas battery is as follows:—Hydrogen and oxygen are "occluded" by platinum black (it is possible that some sort of chemical compound is formed by the platinum black and the absorbed gas). Hence the gases are occluded by the platinum black covering the exposed parts of the electrodes, and the gases then pass, by some process analogous to diffusion, into the platinum black covering the submerged parts of the electrodes. The occluded gases then pass into solution—water being produced, and an electric current being generated, by the combination. In fact, the hydrogen becomes oxidised, just as the zinc in a Daniell cell is converted into zinc sulphate.

Problem.—Determine the smallest terminal P.D. which will suffice to deposit zinc from a solution of zinc sulphate ($ZnSO_4$), platinum electrodes being used.

Given.—Electro-chemical equivalent of zinc (that is, the mass of zinc deposited per second by unit C.G.S. current) = 32·5 $\times$ ·000105 = ·00341 gram per C.G.S. unit of current per second.

Heat of solution of 1 gram of zinc in sulphuric acid = 1670 heat units.

Answer.—P.D. due to decomposition of zinc sulphate into zinc and sulphuric acid = 2·39 $\times$ 10^8 C.G.S. units, or 2·39 volts.

Experiment shows that in order to decompose normal zinc sulphate solution, using platinum electrodes, the smallest P.D. is 2·35 volts. The P.D., however, varies with the concentration of the solution.

(To be continued.)

MESSRS. BELL'S EDUCATIONAL LIST.

EDUCATIONAL CATALOGUE POST FREE ON APPLICATION.

Crown 8vo, 3s. 6d.

SOPHOCLES.—ANTIGONE. Edited by G. H. WELLS, M.A. With numerous Illustrations.

"Of the style in which this volume is printed, bound, and illustrated, it is impossible to speak too highly.....A highly meritorious edition, which should certainly make its way into schools."—*Educational Times.*

Crown 8vo, 6s.

PLATO'S REPUBLIC, BOOK I. AND BOOK II., CC. I.–X.

THE PROEM TO THE IDEAL COMMONWEALTH OF PLATO. (An Introduction to the Language and Substance of the "Socratic" Dialogues.) With Introduction and Critical and Explanatory Notes by T. G. TUCKER, Litt.D. (Camb.), Hon. Litt.D. (Dublin), Professor of Classical Philology in the University of Melbourne.

New Edition, thoroughly Revised, with New Figures throughout.

THE ELEMENTS OF EUCLID. (Books I.–VI., and part of Book XI.) Newly translated from the Greek Text, with Supplementary Propositions, Chapters on Modern Geometry, and numerous Exercises. By HORACE DEIGHTON, M.A., formerly Scholar of Queen's College, Cambridge, Head-master of Harrison College, Barbados. Complete, crown 8vo, 4s. 6d. Or in Parts:—Book I., 1s. Books I. and II., 1s. 6d. Books I., II., and III., 2s. 6d. Books I.–IV., 3s. Books III. and IV., 1s. 6d. Books V., VI., XI., etc., 2s. 6d. Key (for Teachers only), 5s. net.

BELL'S SCIENCE SERIES.

New Volumes.

Edited by PERCY GROOM, M.A., and Prof. G. M. MINCHIN, M.A., F.R.S.

AN INTRODUCTION TO THE STUDY OF THE COMPARATIVE ANATOMY OF ANIMALS. By GILBERT C. BOURNE, M.A., F.L.S., Fellow and Tutor of New College, Oxford; University Lecturer in Comparative Anatomy.

Vol. I.—**Animal Organisation. The Protozoa and Cœlenterata.** Crown 8vo, Illustrated, 288 pages, 4s. 6d.

"His book is simply charming, and well worthy his reputation: and, while its literary style should alone ensure for it a wide circulation, it cannot fail to exercise a leavening and humanising influence on the youthful mind."—*Nature.*

THE STUDENT'S DYNAMICS. Comprising Statics and Kinetics. By G. M. MINCHIN, M.A., F.R.S., Professor of Applied Mathematics in the Royal Indian Engineering College, Cooper's Hill. Crown 8vo, 3s. 6d.

WORKS BY

Charles Pendlebury, M.A.,

Chief Mathematical Master at St. Paul's School.

ARITHMETIC FOR SCHOOLS. *Thirteenth Ed.* Complete with or without Answers, 4s. 6d.; or in Two Parts, 2s. 6d. each. Key to Part II., 7s. 6d. net.

EXAMPLES IN ARITHMETIC. 8,000 Examples extracted from the above Arithmetic. *Tenth Edition*, with or without Answers, 3s.; or in Two Parts, 1s. 6d. and 2s.

A SHILLING ARITHMETIC. *Second Edition.* Small crown 8vo, 192 pages. Cloth, 1s.; or, with Answers, 1s. 4d. The Answers may be had separately, 4d. net.

ELEMENTARY ARITHMETIC. *Fifth Edition.* Crown 8vo, 1s. 6d., with or without Answers.

COMMERCIAL ARITHMETIC. *Second Edition* Crown 8vo, 250 pages, 2s. 6d.

COMMERCIAL ARITHMETIC. Part I. 152 pages. Crown 8vo, with Answers, 1s.

GRADUATED ARITHMETIC. For Private and Junior Schools. In cloth. Parts I., II., and III., 3d. each; IV., V., and VI., 4d. each; VII., 6d. Answers to Parts I. and II., 4d.; III., IV., V., VI., and VII., 4d. each.

LONG TOTS AND CROSS TOTS (Simple and Compound). Containing 864 Sums for the use of Pupils in Evening Continuation Schools and Day Schools under the Education Department. Price 2d.; in cloth, 3d. Answers, cloth, 4d.

EXAMINATION PAPERS IN ARITHMETIC. *Fourth Edition.* Crown 8vo, 2s. 6d. Key, 5s. net.

ELEMENTARY TRIGONOMETRY. *Second Edition, Revised.* Crown 8vo, 4s. 6d.

A SHORT COURSE OF ELEMENTARY PLANE TRIGONOMETRY. Crown 8vo, 2s. 6d.

BELL'S ILLUSTRATED CLASSICS.

Edited by E. C. MARCHANT, M.A., late Classical Master at St. Paul's School.

Full Illustrated Prospectus of this Series post free on application.

THE special object of this Series is to make the editions as interesting and helpful as possible to the intelligent learner, and with this object numerous Illustrations have been introduced. Though based on authentic sources, these are not mere copies of antiquities such as are to be found in every Classical Dictionary, but *pictures* drawn with a view to bringing the reality of Greek and Roman life before the reader.

Views of places, as well as Maps and Plans, are also freely introduced.

The volumes are equipped with Introductions, Notes, Grammatical Appendices, and, in some of the prose authors, Exercises on the Text. Vocabularies are also given, but the volumes may be had without the Vocabularies if preferred.

The volumes are printed at the Oxford University Press, pott 8vo, and are issued in three forms:—

1. **With Notes and Vocabulary complete,** 1s. 6d.
2. **Without Vocabulary,** 1s. 6d.
3. **Text and Vocabulary, without Notes,** 1s.

The following Volumes are now ready unless otherwise stated:—

Caesar.—De Bello Gallico. Book I. Edited by A. C. LIDDELL, M.A. With Exercises.

—— **Book II.** Edited by A. C. LIDDELL, M.A. With Exercises.

—— **Book III.** Edited by F. H. COLSON, M.A., and G. M. GWYTHER, M.A.

—— **Book IV.** Edited by the Rev. A. W. UPCOTT, M.A.

—— **Book V.** Edited by A. REYNOLDS, M.A. With Exercises.

—— **Book VI.** Edited by J. T. PHILLIPSON, M.A. With Exercises.

Cicero.—Speeches against Catiline I. and II. Edited by F. HERRING, M.A. With Exercises.

Selections from Cicero. Edited by J. F. CHARLES, B.A. With Exercises.

Cornelius Nepos.—Epaminondas, Hannibal, Cato. Edited by H. L. EARL, M.A.

Eutropius.—Books I. and II. Edited by J. G. SPENCER, B.A.

Horace's Odes.—Book I. Edited by C. G. BOTTING, B.A.

—— **Book II.** Edited by C. G. BOTTING, B.A. *[Preparing.*

—— **Book III.** Edited by H. LATTER, M.A.

Livy.—Book IX., cc. i.–xix. Edited by W. C. FLAMSTEAD WALTERS, M.A.

Hannibal's First Campaign in Italy. Selected from Livy, Book XXI., and edited by F. E. A. TRAYES, M.A.

Ovid's Metamorphoses.—Book I. Edited by G. H. WELLS, M.A.

Selection from Ovid's Metamorphoses. Edited, with Introduction and Notes, by J. W. E. PEARCE, M.A.

Ovid's Tristia.—Book III. Edited by H. R. WOOLRYCH, M.A.

Phaedrus.—A Selection. Edited by the Rev. R. H. CHAMBERS, M.A.

Stories of Great Men. Edited by the Rev. F. CONWAY, M.A.

Vergil's Aeneid.—Book I. Edited by the Rev. E. H. ESCOTT, M.A.

—— **Book II.** Edited by L. D. WAINWRIGHT, M.A.

—— **Book III.** Edited by L. D. WAINWRIGHT, M.A.

—— **Book IV.** Edited by A. S. WARMAN, B.A.

—— **Book VI.** Edited by J. T. PHILLIPSON, M.A.

Vergil.—Selection from Aeneid, Books VII.–XII. Edited by W. G. COAST, B.A.

Xenophon's Anabasis.—Book I. Edited by E. C. MARCHANT, M.A.

—— **Book II.** Edited by E. C. MARCHANT, M.A.

BELL'S ILLUSTRATED LATIN READERS.

Uniform with the ILLUSTRATED CLASSICS. Price One Shilling each.

Scalae Primae. Simple Stories and Fables for Translation, with Notes and Vocabulary. By J. G. SPENCER, B.A. With 29 Illustrations.

Scalae Mediae. Extracts from Eutropius and Caesar. With Notes and Vocabulary. By PERCY A. UNDERHILL, M.A. With 20 Illustrations.

Scalae Tertiae. Graduated Extracts in Verse and Prose from Phaedrus, Ovid, Nepos, and Cicero. With Notes and Vocabulary. By E. C. MARCHANT, M.A. *[Shortly.*

Specimen Copy sent to Head-masters with a view to introduction.

LONDON: GEORGE BELL & SONS, YORK STREET, COVENT GARDEN.

A QUARTER OF A MILLION VOLUMES

not of a Six-shilling Novel, not the floating success of the hour, but of the greatest English work of recent years,

OPPOSITE ARE THE BOOKS ☞

The Library of Famous Literature,

Edited by DR. RICHARD GARNETT, C.B.,

Has proved the most phenomenal success ever known in the publishing world. Of the new edition offered by "THE STANDARD," the larger part has been subscribed in advance, under a novel and attractive plan of sale. The balance of this edition only can be had upon these same convenient terms and at the reduction in price of nearly one-half from the regular prices. Those who wish to take advantage of this remarkable offer should send for particulars at once. In so doing they may, for a short time only, secure

TWO GREAT BARGAINS IN ONE.

BOOKS.

The "Library of Famous Literature," complete in twenty volumes, probably represents the most notable collection of literature ever gathered together in a single work. It is certainly the most interesting. A thousand of the world's masterpieces are here; not the dead work of dead men, not the classics merely, although the classics are here, but the living work of those of all ages whose accepted primacy in their especial fields has lent them immortality. It panders neither to the rage for modernity nor for that which is merely antique. Nothing has been chosen simply because it was great once, but because it is interesting and vital and stimulative now. Even in the most restricted view, the Library contains little that does not belong incontestably to the great literature of the world, and yet its most essential quality is its readability. Its 10,000 pages are as varied as a newspaper and as interesting as a romance; for they are the pages of romance not of fiction merely, but of history and poetry, and biography and science—in brief, the romance of life itself.

The "Library of Famous Literature" (offered for a limited time at about half-price and on easy payments) is a library in itself. It consists of twenty large and beautiful volumes, making an imposing array on any shelves—in fact, a bookcase is made especially to hold the volumes (and offered to subscribers at a minimum price).

The twenty volumes of the Library are royal octavo, 7 by 9½ inches; each contains 500 pages of large, clear type, cast specially for the Library; the paper also was especially made, with a clear, soft, unglazed surface and substantial body, with extremely light weight.

The total number of pages is over 10,000, not counting the lavish illustrations. There are, on an average, 500 words to a page, the total number of words thus reaching near four and a half millions. The twenty volumes contain 400 of the best stories, 300 of the finest poems, and similar liberality of selection from the fields of travel, adventure, biography, and autobiography, philosophy and science, religious meditation, criticism, essays, wit and humour—every phase, in fact, of literary activity.

PICTURES.

So many of the earlier subscribers to the "Library of Famous Literature" wrote to *The Standard* asking if some of the 500 illustrations could not be secured in a larger form, suitable for framing, that arrangement has been made to issue to each subscriber a series of hand-etched Imperial Photogravures of the finest workmanship and quality. Thus *The Standard's* offer includes, in the one price, volumes of such store that they honour the shelves, and pictures to adorn the walls, of any library or any home.

These photogravures are printed by hand on the finest quality of plate paper. The full size of the engravings is 22 by 28 inches, the engraved surface averaging 12 by 15 inches. The subjects chosen for reproduction, after diligent research, are especially appropriate for a library, and constitute ten masterpieces of literary paintings, by such artists as PUVIS DE CHAVANNES, WHISTLER, G. F. WATTS, G. H. BOUGHTON, etc. An illustrated brochure describing them will be sent post free to any one sending the form adjoining.

That *The Standard* should be able to make to each subscriber to a great work (already offered at a reduction of almost half) a present of ten Imperial Photogravures would seem to demand one of two things—the selection of a very inferior grade of photogravure, or a new method of procuring these handsome works of art. It is hardly necessary to say that the latter method has been chosen. The photogravures are of the highest quality.

The usual method of dealers in photogravures is to make one plate, and take from it not more than a hundred impressions. The first cost of the plate is so heavy, and the public demand so uncertain, that a high price must be charged for each impression—from one to five guineas. Being assured of a very large demand, *The Standard* has had a number of plates made of each of the ten subjects; this reduces the cost of each impression very materially without in any way lowering the quality of the work. The usual profits of middleman and retailer are also abolished. The offer is plainly a remarkable one; unfortunately, it is also limited.

The Twenty Volumes OF THE "Library of Famous Literature" **BOTH & FOR** The Ten Photogravures OF THE Famous Literary Paintings

A PRELIMINARY PAYMENT OF

ONLY HALF-A-GUINEA IF SENT NOW. BUT Owing to the large advance demand already booked,

This opportunity is STRICTLY LIMITED.

To obtain the 100-page Prospectus and the 16-page Brochure post free, simply **TEAR THIS OUT** and post it to

W. M. JACKSON, "The Standard,"
23 St. Bride Street, E.C.

Please send Prospectus of "The Library of Famous Literature" to

.....

P.T. 1 .....

.....

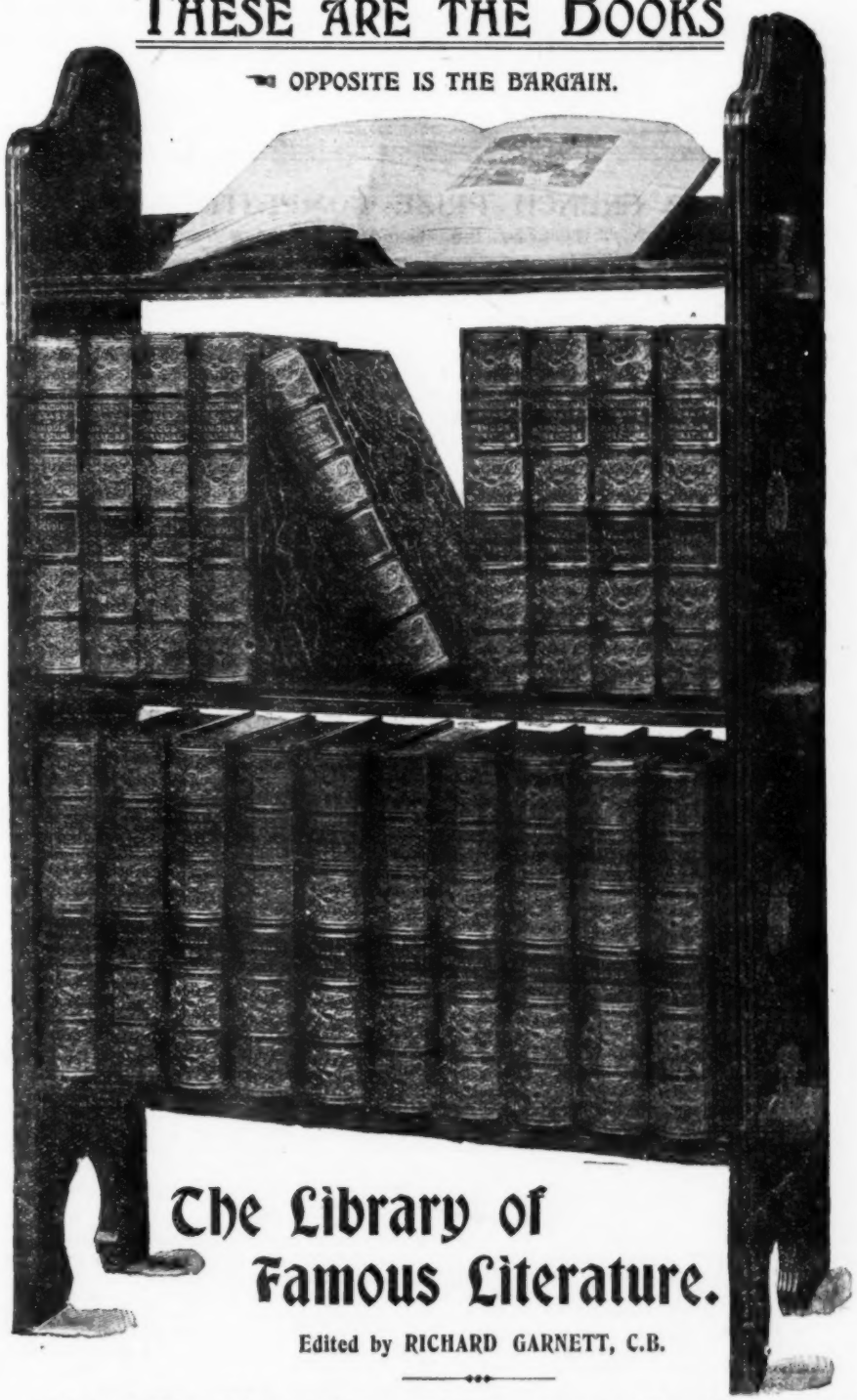
The Books and Photogravures are on exhibition at "The Standard" Offices, 23 St. Bride Street, E.C. To those who cannot visit the Offices, but will send name and address, and mention the name of "THE PRACTICAL TEACHER," or will send the adjoining form, "THE STANDARD" will send Post Free

A handsome 100-Page Prospectus
Of Specimen Pages and Specimen Illustrations.

A Charming 16-Page Brochure
Of Miniature Reproductions of the Photogravures.

THESE ARE THE BOOKS

OPPOSITE IS THE BARGAIN.



The Library of Famous Literature.

Edited by RICHARD GARNETT, C.B.

Though these 20 sumptuous volumes are now offered at less than half the regular prices, and on the most remarkable terms, with the offer is included a Portfolio of 10 superb Hand-etched Photogravures.

FOR PARTICULARS SEE OPPOSITE PAGE.

OUR COMPETITION PAGE

OUR FRENCH PRIZE COMPETITION.

Prize Editor—W. T. THOMPSON, B.A. (LOND.), *French and German Honours.*

Important to Scholarship, Certificate, and London Matriculation Students.

WE should like to specially direct the attention of our readers to the fact that the Board of Education, in the Syllabuses for the Scholarship and Certificate Examinations 1901, requires "no set books" for French and German. Students preparing for these examinations, as well as students for London Matriculation, could not do better than attempt month by month the pieces set for translation here. They are from the best authors, and of varied character. A competitor who does not gain a prize can derive considerable benefit from the exercise. A study of the successful competitor's translation, and of our remarks, will help him to see where he might have done better. If desired, his paper can be returned (fully corrected) by enclosing six stamps.—ED.

FRENCH PRIZE COMPETITION.

A Prize of One Guinea will be given for the best translation into English of the following extract:—

Marguerite me paraissait digne d'occuper mon cœur, je lui ouvrais toutes grandes les portes du sanctuaire. Tous mes désirs confus, toutes mes vagues aspirations avaient enfin pris corps et s'étaient subitement cristallisés en elle. Mon sentiment d'adoration était même déjà si véhément, que je m'étais mis à aimer d'emblée, par la même occasion, toute la famille de Marguerite, frères, sœurs, père, mère, comme si tout ce monde eût été mien. Ses frères? Mais je ne pouvais les voir passer sans les suivre, eux aussi, d'un œil amoureux, tant ils avaient sa ressemblance, et je me plaisais à retrouver dans leurs traits les délicates perfections de son visage. On va rire de moi, mais n'importe. Comme pour confirmer la justesse de ce mot de Molière, à propos d'un amoureux—

Jusqu'au chien du logis il s'efforce de plaire,

il n'était pas, en effet, jusqu'au chien, un joli griffon au poil jaune et rude, *Pacha* (je connaissais, vous le voyez, le nom de chacun), que je ne suivisse de l'œil avec complaisance. J'avais même englobé tout d'abord par mégarde dans cette affection générale, un vieux monsieur à moustache et barbiche blanches qui se trouva ensuite n'appartenir en rien à la famille.

JOSEPH TURQUAN.

RESULT OF THE SEPTEMBER COMPETITION.

French.

The prize is awarded to "Desdichado," the pseudonym of Mr. Tom L. Davies, 102 Alwa Street, Abertillery, Mon.

First Class.—Poingdestre, Bonne Chance, Wemmick, Edina (Edinburgh), Oakover, Torquato Tasso, Crockitwuds, Helvetia, Clio, P.W.D.V., G.B., Myosotis, Meinnach, Kerboga, Automobile, Torridge, Bablake, Eile mit Weile, Dor, S.H.C.J., X.N.M.C., Tartarin, A plain woman, Agaznog, Septimus, Edina (Durham), Iceberg, Helen F. Bee, Beta, Frida, Jesmond, K.H., Titi parisien, C.E.M., G.B.N., Mancunian, Normalienne, Carmen, Semper fidelis, Audax quidvis aggredi, Lucien, Chemineau, Roma, Liverpool, La plume, Undergrad, Llanroc, Dalrymple, Pandora, Cairnaquheen, Sipa, Stretton, Revoe, Antiochus, Veritas, Ambiguous, Antonia, Dies, Cosmos, Forward, J.P., Nugipolyloquides, Devonia, Heather, Red Cross Knight, Mardun, Scholarship, Nortoniensis, J.E., Staley, Kythe, Maida Vale, Penweeth, Annette, Dodo, Hélène, Carpe diem, Malvoisin, Kofel, Richmondshire, Comus, Handwriting, Micawber, Hungarian demon, Œdipe, Rioghail, Clowes, E.S.G., Kettering, Integer, M.E.R., L'espérance, Maid Marion, Anwyl Gariad, Raven, S.A.G., Rutherford, Etireugram, Black Bishop, Surds, Georgius, Credo, Consuetudo, Map, Osmunda, A.B.C., E.S., Sheila, Spes (Newcastle), Bees, Uranie, Rus, P.T., Kildala, Captain Cuttle, Goal, Pheenie, Ginger, Orphir, Alectrice, Olim, Kitaitz, Tolpan, Richard II., Egyptian, Rhynie, H.I.D., Celt, Emerby, Wyndham, Quin, Jeanie Deans, Spiug, Sidney Castor, S.T.S., Killarney, Deutzia, Yeo, Prince, Zoroaster, Ecossais.

Second Class.—Sweetbriar, Vigilabo, Mrs. Poyser, Marchand, Kirkton, Deb, Camo, Dunelm, Iris, H.F., Discipulus, Nightingale, Nil desperandum, Clarionette, Novice, Tan, L.N., Pactum serva, Anchor, La disette, Henri R., Yellow Crab, Qui va là? Villette, Stewart, Abigail, Vélocipède, Borealis, Bonne Espérance, Planète, Glen, Punch, Amicus, Thelma, 2nd year P.T., Irénée, Diana, Mac, Mannin v.v.v., Olivia, Claudia, C.J.V., Spes (Uxbridge Road), Daisy, Bluebells, Slinger, Opal, K.M., Sylvia, Peggoty, Maimie, Marguerite, Teapot, Sogal, Brunette.

Third Class.—First Try, G.G., X., La Corbière, Morganwg.

Disqualified, Rule 2: Prestune. Rule 3: Eromtrag. (Will Eromtrag please send name and address for the return of corrected paper?)

Report.

The apparent ease of the piece set induced a larger number of candidates to attempt it, but many in the First Class owe their positions to lack of error rather than to positive merit in translation. Too many candidates appear not to have enough critical power to enable them to see the incongruities involved in their renderings. Thus a fairly large number of candidates translated *disette* as "poverty," while there are not a few examples of such questionable phrases as "in a fit of inconstancy," "in accordance with his inconstant principles." The word *état* was, in very many instances, not translated correctly by candidates, who were unacquainted with its use in the sense of "trade," "profession," "calling," etc.; whilst the inversion in *ce que n'avaient pu faire*, etc., caught a somewhat large number.

French Prize Translation.

In the meantime, Antioch was a prey to famine, which had so long afflicted the Crusaders, and every day the number of its defenders grew less.

Accien sued for a truce, and promised to surrender unless speedily relieved. The Crusaders, always full of blind confidence, agreed to a peace which was bound to throw away all their advantages, and give the enemy the means of gaining time and recruiting his strength.

The besieged had availed themselves of the truce to obtain help and necessary provisions. The Christians displayed merely impotent courage at the foot of the walls, and the town, after a seven months' siege, was still able to hold out against their force of arms for a long time, had not ambition and cunning accomplished for the object of the Crusaders what patience and bravery had been unable to effect.

Bohemond, who had been attracted to the Crusade by a desire to increase his fortunes, was everywhere seeking a chance to accomplish his ends. Baldwin's good fortune had aroused his jealousy and haunted his dreams.

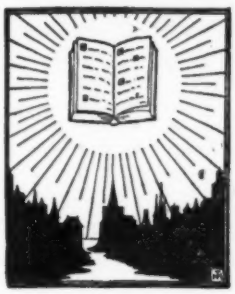
He dared to cast covetous eyes on Antioch, and fortune favoured him so far as to throw in his way a man who had the power to deliver the town into his hands.

Whatever several historians may say, who declare him to have been of noble birth, this man, whose name was Phirous, was the son of an Armenian manufacturer of armour.

Of a restless and stirring temperament, he unceasingly sought to better his position and circumstances. He had forsworn the Christian religion through a fickle disposition, and in the hope of furthering his interests.

He was gifted with admirable self-possession, and an audacity that was proof against everything; and was ever ready to do for money what could hardly be expected from the most fiery zeal.

DESDICHADO.



Moffatt's English School Classics.

NEW SERIES.

MOFFATT & PAIGE are issuing at a low price a new series of some of the most important works in English Literature, with Introduction and Notes intended for the use of Classes in Schools, Pupil Teachers, and Students generally.

These books are edited by THOMAS PAGE, whose editions of Shakespeare's Plays are so well known.

The following are now ready :—

GOLDSMITH'S The Traveller. Price **3d.**

GRAY'S SELECT POEMS.

(1) **Elegy in a Country Churchyard.**
(2) **The Bard.**
(3) **The Eton College Ode.**
(4) **The Progress of Poetry.**

} In one Book, **4d.**

MACAULAY'S Essay on Milton.

Specimens gratis to Principals.

MOFFATT & PAIGE, Ltd.,
28 Warwick Lane, Paternoster Row, LONDON, E.C.

A NEW SERIES OF READERS, based upon Kindergarten Principles.

The "Helpful" Nature Knowledge Readers.

Containing **WELL-WRITTEN LESSONS.** Setting forth important and instructive features associated with the **FOUR SEASONS.**

SIMPLE and **SUITABLE POETRY** is included.

All the **Illustrations** have been specially drawn for the book ; some of them are **printed in colours.**

BOOK I. (FOR STANDARD I.) Price **9d.**; per doz., net, **6s. 9d.**
BOOK II. (FOR STANDARD II.) „ **1s. 2d.**; „ „ **10s. 6d.**

NEW RECITATION BOOKS.

The "RUPERT" Recitations, Dialogues, and Guessing Rhymes. By A. ASENATH SMITH. Price 9d. net.

"WINSOME WORDS." Being Recitations for the Little Ones. By ELLEN TERREY. Price 6d. net.

CHARLES & DIBLE,

Kindergarten and Educational Publishers.

LONDON— 10 Paternoster Sq., E.C. | **GLASGOW—** 155 St. Vincent Street.

DAY TRAINING COLLEGE,

White Street, Finsbury Street, and Ropemaker Street, Moorfields, London, E.C.

APPROVED BY THE EDUCATION DEPARTMENT, AND RECOMMENDED BY HER MAJESTY'S INSPECTORS.

Principal: PROFESSOR CUSACK.

Scholarship, 1901.

New Classes began as follows:—

SATURDAY CLASSES	**October 20**
Afternoon Classes	**October 16**
Correspondence Classes	**October 16**

To secure Admission, immediate application is necessary.

£480. PRIZES. £480.

This being the Twenty-first Year of the existence of the College, Professor CUSACK offers the following PRIZES for Competition among Scholarship Students, to celebrate THE COMING OF AGE:—

Two Prizes of One Hundred Pounds each. One payable to that one of his pupils who may head the 1901 Boys' Scholarship List; the other payable to that one of his pupils who may head the 1901 Girls' Scholarship List.

Eighteen Prizes of Ten Pounds each. One payable to each of his pupils who, not being a winner of one of the foregoing prizes, shall obtain a place within the first ten on either the Boys' or the Girls' 1901 Scholarship List.

Twenty Prizes of Five Pounds each. One payable to each of his pupils who, not being a winner of one of the foregoing prizes, shall obtain a place within the first twenty on either the Boys' or the Girls' 1901 Scholarship List.

THESE PRIZES WILL ALL BE PAYABLE IN CASH immediately on the publication of the 1901 Scholarship List. The prizes for first place previously offered were won twice within three years. The Five Guinea prizes previously offered were won each year since they were first offered. The usual prizes for excellence in special subjects during the year will also be awarded.

Pupil Teachers, 1901.

New Classes began as follows:—

SATURDAY CLASSES	**October 20**
Afternoon Classes	**October 15**
Correspondence Classes	**October 16**

To Secure Admission, immediate application is necessary.

Certificate, 1901.

New Classes began as follows:—

SATURDAY CLASSES	**October 13**
Evening Classes	**October 16**
Correspondence Classes	**October 18**

In order to further celebrate the **COMING OF AGE** of the College, Professor Cusack will award **A PRIZE OF BOOKS, VALUE ONE GUINEA,** to each of his Certificate Students (Men or Women, First or Second Year) who obtains a Double First at the Examination in 1901.

Prospectus and full particulars now ready. Will be sent post free on application. All applications to be addressed to Professor CUSACK.

THE EDITOR'S TABLE

MODERN LANGUAGE TEACHING.

1. THOMAS NELSON AND SONS' FRENCH AND GERMAN SERIES.

Trésor des Fèves et Fleur des Pois. This charming tale by Nodier supplies reading matter which will delight pupils of many ages and various stages of attainment. We advise English teachers to read Dumas' fascinating sketch of the whimsical, eccentric Charles Nodier, which we read years ago with vivid pleasure. They will thus gain some idea of Nodier's quaint personality, and appreciate the better his peculiarly delightful style. Their pupils will then find the reading of this fairy tale not a task but a treat. Dumas says, "Nodier avait une certaine humilité naturelle, une certaine pente à se faire petit lui-même qui l'entraînait vers les petits et les humbles." He is therefore pre-eminently the children's author. The publishers are well known for the attention they devote to the needs of modern language teaching in England, and for the excellent get-up of their publications; hence it goes without saying that the annotations, printing, and binding are exceptionally good.

Elementary Object Lessons in French. Book I. This interesting and useful book contains a carefully graduated series of conversation lessons, fully illustrated by pictures and diagrams. To each lesson is appended a section on the simpler grammatical forms of the language, among which the verb rightly receives special attention. The teacher who is conversant with the new methods will not detach the verb forms from their place in the complete sentence—that is, he will not say *je suis, tu es*, etc., but *je suis un monsieur, tu es un enfant*, etc. The book also contains valuable exercises in phonetics, by means of which pronunciation may be made the subject of minute care from the first; and lastly, a synopsis of grammatical rules, and vocabularies.

Object Lessons in French. Book II. The conversational lessons here are somewhat more advanced, and are illustrated by means of a large number of pictures and diagrams, with well-prepared wall-sheets, 31 in. by 21 in., to correspond. The readings are founded upon the subject-matter of the lessons, and at the end there are a few English exercises to be translated into French. We presume that the latter have been added out of consideration for the conservative teacher who cannot yet grasp the fact that French can be learned *without* the inevitable translation.

Object Lessons in German. A translation of the above, destined, we hope, to lighten considerably the labours of the young student who aims at acquiring the cumbrous but magnificent language of our Teutonic rivals.

To the English teacher who has seen modern methods in action in Continental schools, who has read the works of Hartmann, Algé, and other reformers, these text-books are a welcome sight. We recommend teachers of French and German not only to adopt them and the enlightened reforms they suggest, but also to insist upon the corresponding reform which must necessarily take place in English language examinations before these better methods can receive their due recognition. Most language examinations held in England are at present based upon the ancient method of grammatical rules and exceptions and silly exercises—the cookery-book method, as it may aptly be styled. The teacher supplies his victim with a list of foreign words and their English equivalents. These are the ingredients. Next, one or more grammatical rules—the recipe. With the ingredients and the recipe, the poor juvenile is expected to *cook* his French or German forthwith; and any teacher who has employed this method knows well the kind of decoction which results. Still, the practical teacher has to face the fact that at present even a *preliminary* examination in French demands "a sound knowledge of the grammar."

The old methods and the new do not merely differ. They are diametrically opposed. The examiner on the ancient plan will require of the beginner both grammar and translation. The teacher of the new school will reply that his beginner does *no* grammar, *no* translation. The advanced student under the old system would be able to translate, would indeed be obliged to translate, in order to comprehend the foreign tongue. The advanced student of the new methods, after his years of practical exercise in speaking and thinking the foreign language, would also have acquired great skill in translation, but would read the French or German in order to understand and then translate it. Further, the old methods create disgust, tedium, dislike of the language. The new are designed to create a love of the language, to entice the pupils to speak and read it for pleasure.

These new, natural, attractive methods are certain ultimately to overthrow the ancient, dead-language system, even though a certain English slowness in assimilating new ideas may retard progress for a time. The books before us are a courageous and successful attempt to adapt for English use the Intuitive Method, which has gained such favour on the Continent. The central idea of this method is *directness*. The teacher must show his pupil an object, and name it in French; must perform an action, and give the French verb; must speak a foreign word of command, and have it understood and obeyed. There must be no wandering round from the idea to the English word, and thence to the corresponding French vocable.

There is nothing appallingly new and daring in the plan adopted in Mr. Cran's manuals. The method is merely the outcome of common sense, and a study of the natural process by which the child learns to talk. With young children, the first lessons should be exercises in understanding, perhaps only dimly, various commands uttered very distinctly in the foreign tongue. Then the more intelligent pupils may give the commands, and thus a small beginning is made in speaking the language. Next, real objects are taken to serve as material for simple lessons similar to those of Book I. The teacher naturally begins with the immediate surroundings of the child—the classroom and its contents, the parts of the human body, garments, plants, flowers. Even living pets—the dog, cat, canary, goldfish—may serve a useful purpose, if the teacher is ready and resourceful.

But soon a limit is reached at which the picture and wall-sheet come in as indispensable aids. Even if the language teacher chance to be skilful as a blackboard illustrator, it is unwise to waste time by making elaborate drawings. Anything but simple, rapid sketches would consume too much valuable time, when the aim is abundant oral practice in foreign speech. After considerable preliminary work of this kind, the class may commence Book I., and the teacher should not be in too great haste to commence written exercises. One of the great difficulties with older students, who have followed bookish methods, is that the ear is left comparatively untrained, and the student is at a loss without the written word. It would be better to see to it that the ear be free from the first, quick to catch the glibly spoken word without aid from the eye. This is one great advantage to be attained by Mr. Cran's picture method.

We have already remarked that this method need not scare the conservative teacher by its daring novelty. It is really old. Comenius, Rousseau, Pestalozzi had already discovered the educational value of pictures. In 1776, a picture representing Spring was used as the basis for conversation exercises at an examination in French. Later, the method fell into oblivion, and had to be reinvented.

On the Continent, the manuals based upon this method are legion. In this country they must be rarities, for, so far as we have seen, the well-prepared manuals before us occupy the honourable position of first in the field—first to adapt the *Méthode Intuitive* to English use. A glance at these books at once shows that they are interesting. This for the teacher is an immense gain. *C'est autant de gagné sur l'ennemi.* What language teacher does not know by sad experience the inborn antipathy of the average British schoolboy for any and every foreign tongue, dead or living? A French friend used to tell of an English boy who refused to learn his German because it "sounded rubbish." Then, too, who has not groaned under the weary grind of translation and retranslation, the tedious correction of stupid exercises done into impossible French, the incurable *ennui* clinging to what should be the brightest and best of studies? For is not language closely bound up with life? If the teacher uses these

ANOTHER SEAMAN AND

DR TIBBLES' Vi-Cocoa

DAINTY SAMPLE FREE.

"There is nothing like Vi-Cocoa."

Mr. P. MORRIS, Mess 81,
H.M.S. Royal Adelaide, Chatham Depôt:—

"I am pleased to say that I have found out for myself that Dr. Tibbles' Vi-Cocoa is the best that I have yet tasted. I get Service cocoa every morning, but I prefer Vi-Cocoa. It is far more nourishing and refreshing, and I can certainly say that if any one gives it a fair trial, I am certain they will be satisfied, and say that there is nothing like Vi-Cocoa.

"If you wish to make use of this letter, you are at liberty to do so."

"Undoubted Purity and Strength."—*Medical Magazine.*
"In the Front Rank of Really Valuable Foods."—*Lancet.*

DR TIBBLES' Vi-Cocoa

Favoured by the Homes and Hospitals of Great Britain.
Dainty Sample Tin Free to any Address.
Address: Dr. TIBBLES' VI-COCOA, Ltd., 60 Bunhill Row, London, E.C.

JUST READY. ***PRICE 2d.***

. . . NOVEMBER NUMBER OF . . .

THE PRACTICAL TEACHER'S ART MONTHLY.

FULLY ILLUSTRATED CONTENTS.

A Large Supplement Presented: Industrial Drawing—Stage V.

FAMILIAR BIRDS: The Jay.

STENCILLING FOR BEGINNERS. By ROBERT T. MUMFORD, Art Master, School Board for London.

INDUSTRIAL DRAWING. By J. VAUGHAN, Art Master, School Board for London.

FREEHAND DRAWING. By BENJAMIN T. HASTWELL.

THE DAILY ROUNDS OF A DRAWING INSPECTOR.

A GOLDEN HINT.

MODELLING IN CLAY. By the late T. CANNON. Arranged by J. H. COLLINGWOOD.

DRAWING FOR THE SCHOLARSHIP EXAMINATION. By J. H. COLLINGWOOD, Finsbury Pupil Teacher School.

AN ILLUSTRATED SYLLABUS OF ART INSTRUCTION FOR SECOND YEAR PUPILS IN A SCHOOL OF SCIENCE. By WM. R. BULLMORE, Art Master, Municipal Technical School, King's Lynn.

AYRSHIRE E.I.S. AND DRAWING.

BOARD OF EXAMINATIONS FOR EDUCATIONAL HANDWORK. Results of Examinations at Summer Holiday Courses.

LEIPZIG COURSE, 1900.

EDITORIAL NOTES.

NATIONAL ASSOCIATION OF MANUAL TRAINING TEACHERS.

Order from your Bookseller now.

Annual Subscription by post, 2s. 6d., direct from

The Practical Teacher Office, 35 and 36 Paternoster Row, . . . LONDON, E.C.

books there need be no *ennui*. The lessons will be full of life, interest, variety, animation.

But there are other advantages. An essential point in the new methods is the most scrupulous training in pure pronunciation from the very first lesson. To avoid bad accent, there must be no see-sawing from English to French, from French to English; or, to use Hartmann's expression, there must be no *Hin-und-Herpendeln*. The poor child who has to gabble, *je suis = I am*, *tu es = thou art*, etc., is not only acquiring a hatred of French, but is also ruining his accent. Any teacher who has a good French or German pronunciation knows how difficult it is to change one's accent rapidly into English, when a quotation or English proper names crop up suddenly in the course of a French or German reading. With these manuals, the teacher can reduce the use of English to a minimum, and keep to the foreign tongue throughout the lesson, only resorting to English in case of difficulty, and in order to save time.

For the benefit of teachers to whom the method is new, the publishers have issued an explanatory pamphlet, entitled, *The Natural Method of Teaching Modern Languages*. We recommend this to all teachers who have not yet abandoned the old methods. It will be seen therefrom that large picture sheets, 31 inches by 21 inches, have been prepared for use in connection with the books, so that the teacher is provided with a ready-made basis for easy conversation, a means of imparting a large stock of useful words and phrases, bearing upon subjects closely connected with the everyday life and interests of the pupils. Naturally, the versatile teacher will not tie himself down slavishly to the exact questions and answers given in the manuals, nor to the pictures supplied by both books and wall-sheets. If he is a skilful knight of chalk and duster, he will vary the lessons by means of blackboard sketches of whatever is calculated to please his pupils, giving the foreign name of each object, or part, as it is drawn. Children love to see a drawing develop gradually before their eyes; and the master who can speak the language and also draw well, will not be troubled with listless, inattentive pupils.

Lastly, the most conclusive argument in favour of the *Enseignement Intuitif* is to be drawn from a consideration of what the acquisition of a foreign tongue really means. Like every other educational process, it implies the acquirement of certain mental habits. To use a physiological expression, the pupil's brain and organs of speech are constantly gaining the power to perform new *reflex actions*; so that, while the initial process consists of slow and painful efforts with simple words, the final process is the easy conquest of intricate sentences. At first his tongue stumbles at little words like *ich*, *auch*, *nicht*. But after years of patient study, using the language in speaking, reading, writing, his brain can grasp even the huge, ponderous German phrase of newspaper article or *Curialstil*. At the commencement of his French studies, he cannot say *Monsieur* without infinite pains; but after many years, he will even know what a Frenchman means by a quaint Gallicism like *Trop gratter cuit, trop parler nuit*, or *Vous ne vous mouchez pas du pied*. If, then, language study means learning mental habits, why not put the pupil in the way of learning useful ones from the commencement? Translation, as a habit, is bad—fatal to future fluency in either speaking, reading, or writing the foreign tongue. The study of the abstract before the concrete is a pernicious habit. Then why cram children's brains with grammatical generalisations based upon facts of which they are as yet ignorant?

The mental habits acquired from these lessons will be of the right kind, leading the child's mind by a pleasant path towards the direct enjoyment, the direct use of the foreign language either as conversation or as literature. The method is sound, well-proved, effective—no mere chimerical fad, but a system in practical use on the Continent in thousands of educational establishments. The authors of Nelson's Object Lessons have admirably executed their task of adapting the method for English use, and by its means a splendid grounding in French and German can be laid.

G. W. BACON AND CO., LIMITED.

Coloured Plates of the Commoner Poisonous Plants. This is a valuable set of pictures, useful for object-lessons in all schools, but especially in rural schools.

GEORGE BELL AND SONS.

The Preparatory English Grammar. By W. Benson, B.A. This is a carefully compiled little book for children attending preparatory schools. For such it will be found useful, there being a great need for supplementing Latin grammar by the grammar of the mother tongue.

BLACKIE AND SON, LIMITED.

Livy, Book VI. By W. Cecil Laming, M.A. This is an admirable book, a very gratifying advance upon the old editions of the Latin authors. There are no less than thirty illustrations, including a good plan of Rome. The introduction takes up thirty pages, and the notes, vocabulary, and exercises occupy more than half the space of the book. This in itself is evidence that the author has done his work in a thorough and careful manner. We shall be glad to see more of this excellent series.

Junior Division Arithmetic. A very carefully drawn up set of examples in mental and written work for the lower standards.

W. AND R. CHAMBERS, LIMITED.

Chambers's Story Readers. This is a good little reading book for the infants. Teachers should send to Messrs. Chambers for specimen copy, and judge for themselves.

W. B. CLIVE AND CO.

The Tutorial History of English Literature. By A. J. Wyatt, M.A. (University Tutorial Series.) The origins, growth, and development of our literature are here clearly discussed; English literature is shown to have continuity from the earliest Old English poems till to-day. The author has been very successful in his lucid statement of the qualities which differentiate the various periods, and the causes of their growth and decay.

A really admirable feature of the book is the critical appreciation of our greatest writers, and for this every intending candidate for London University examinations requiring English should possess a copy. It is by no means easy, for instance, to point out clearly why Spenser is so admired by other poets and yet is neglected by the general public, or to clearly distinguish between the qualities of writers so alike as Wyatt and Surrey, or Collins and Gray. In exact definition and clear analysis the author is very helpful, and the copious extracts are admirably chosen.

It is painful to find the number of students who try to substitute knowledge of a text-book on literature for an acquaintance with literature itself. Mr. Wyatt gives a prominent position to a list of works by the greatest authors, to be read before his chapters dealing with them—a very well selected list, too, though most readers must omit the Beowulf.

Unfortunately the book could not be used as the only text-book necessary, for two reasons. The author has been very sparing in his selection, and many such authors as Sidney, Herrick, Mandeville, Samuel Butler, and More are altogether omitted; and, by making 1832 the end, we lose a most important section. Why not include an appreciation of Thackeray, Tennyson, Carlyle, the writers of the last generation, even although we cannot yet view the development of the literature of their period in true perspective?

J. M. DENT AND CO.

A Short History of the British Empire. By G. E. Green, M.A. This is a type of text-book that we should be glad to see more of. The author, whilst treating the subject in a scholarly manner, has always borne in mind that he is writing for children, and so has judiciously selected his matter accordingly. An excellent feature of the book is the large number of good illustrations which have been chosen with a view of supplementing the text by arousing the interest of the scholars in the dress, armour, architecture, etc., of different periods. We can thoroughly recommend it to all for whom it is intended.

EYRE AND SPOTTISWOODE.

The Welsh Charity Schools. By David Salmon. A well-written and interesting brochure reprinted from *The Educational Record*. Price 3d.

JARROLD AND SONS.

School Punishment Book. This book is specially designed to meet the new demands of the Education Board. For one shilling the teacher is provided with space in which to record the punishment of two hundred and fifty children. If he be economical, however, he can make it extend over four times this number, for at least two square inches of paper is allotted to the culprit's name, and two more for the signature of the teacher who inflicts the punishment.

W. AND A. K. JOHNSTON.

These well-known publishers have added **The Ironfounder** to their series of Pictorial Illustrations of Trades; **The Birch Tree** and **The Mahogany Tree** to their Illustrations of Trees.

APPROVED SCHOOL BOOKS

By Dr. CORNWELL, F.R.G.S.

"We are qualified, by ample trial of the books in our own classes, to speak to their great efficiency and value. We have never known so much interest evinced, or so much progress made, as since we have employed these as our school books."—EDUCATIONAL TIMES.

A SCHOOL GEOGRAPHY. 88th Edition. **3s. 6d.**; or with 30 Maps, **5s. 6d.**
"Very superior to the common run of such books. It contains a good deal of useful matter of a more practical kind than usual, which the exercises are likely to impress on the mind more deeply than by the parrot system."—*Athenæum.*

A SCHOOL ATLAS. Consisting of Thirty Small Maps. A Companion Atlas to the Author's "School Geography." **2s. 6d.**; or **4s.** coloured.

GEOGRAPHY FOR BEGINNERS. 68th Edition. **1s.**; or with 48 pages of Questions, **1s. 4d.** Questions, **6d.**
"A very useful series of educational works, of which Dr. Cornwell is either author or editor. It ('The Geography for Beginners') is an admirable introduction. There is a vast difficulty in writing a good elementary book, and Dr. Cornwell has shown himself possessed of that rare combination of faculties which is required for the task."—*John Bull.*

SPELLING FOR BEGINNERS. A Method of Teaching Reading and Spelling at the same time. 4th Edition. **1s.**

THE SCIENCE OF ARITHMETIC. A Systematic Course of Numerical Reasoning and Computations; with very numerous Exercises. By JAMES CORNWELL, Ph.D., and Sir JOSHUA G. FITCH, LL.D. 26th Edition. **4s. 6d.**
"The best work on arithmetic which has yet appeared. It is both scientific and practical in the best and fullest sense."—*London Quarterly.*

KEY TO SCIENCE OF ARITHMETIC. With the Method of Solution to every Question. **4s. 6d.**

ALLEN & CORNWELL'S SCHOOL GRAMMAR. 64th Edition. **2s.** red leather; or **1s. 9d.** cloth.
"The excellence of the grammar published by the late Dr. Allen and Dr. Cornwell makes us almost despair of witnessing any decided improvement in this department."—*Athenæum.*

GRAMMAR FOR BEGINNERS. An Introduction to Allen and Cornwell's "School Grammar." 87th Edition. **1s.** cloth; **9d.** sewed.
"This simple Introduction is as good a book as can be used."—*Spectator.*
☞ *The Book is enlarged by a Section on Word-building, with Exercises for Young Children.*

THE YOUNG COMPOSER. Progressive Exercises in English Composition. 48th Edition. **1s. 6d.** Key, **3s.**
"The plan of the work is very superior. We are persuaded this little book will be found valuable to the intelligent instructor."—*Westminster Review.*

POETRY FOR BEGINNERS. A Selection of Short and Easy Poems for Reading and Recitation. 13th Edition. **1s.**

SCHOOL ARITHMETIC. 18th Edition. **1s. 6d.** Key, **4s. 6d.**
"Eminently practical, well stored with examples of wider range and more varied character than are usually given in such books, and, its method of treatment being thoroughly *inductive*, it is pre-eminently the book for general use."—*English Journal of Education.*

ARITHMETIC FOR BEGINNERS. Combines simplicity and fullness in teaching the First Four Rules and Elementary Fractions. 9th Edition. **1s.**

London: SIMPKIN, MARSHALL, HAMILTON, KENT, & CO., LIMITED. Edinburgh: OLIVER & BOYD.

Just Published. Price 1/6.

FREEHAND DRAWING OF ORNAMENT.

Consisting of 24 Photographic Reproductions of Examples of Relief Ornament and 68 Analytical Diagrams of Construction, designed and arranged in graduated order, with directions to the Student as to the method of proceeding.

By JOHN CARROLL,

Art Master and Examiner in Drawing, Author of "Practical Geometry for Science and Art Students," etc.

"No private student wants better or more complete help in this subject than is to be found in the pages of this book. It has sound advice, excellent teaching, and 24 beautifully produced photographs to work from in a neat, well-arranged, and graduated form."—*Schoolmaster.*

BURNS & OATES, Ltd., 28 Orchard St., London, W.

NOW READY.

ENGLISH. NEW CODE (1900).

FIRST GRAMMAR READER.

By JOHN R. TIMSON, B.A.
(St. Mark's, 1878-76).

Large Type. Strongly bound, 1s. 6d.

Teacher's Oral Text-book (Standards I.–IV.) and Revision Reader (Standards V.–VII.).

For the first year's course this work contains just what can be well done and no more. Forty lessons are graduated for forty weeks, with easy explanations in simple language, and careful revisions as worked out in many years of actual teaching. No long exercises and dry lists. Brief memory notes.

JOHN MARSHALL & CO., Paternoster Row, E.C.
E. J. ARNOLD & SON, Leeds.

☞ TWO NEW BOOKS ☜

Published by THOMAS NELSON AND SONS.

Ready in November. Extra Cloth. Price 2s. 6d.

Differential and Integral Calculus for Beginners.

Specially arranged to suit the requirements of Students of Physics and Mechanics.

By EDWIN EDSER,

Associate of the Royal College of Science, London; Fellow of the Physical Society of London; Lecturer in Mathematics and Physics, Woolwich Polytechnic.

Ready in November.

CORNELIUS NEPOS:

Lives of Miltiades and Epaminondas.

TEXT, TRANSLATION, NOTES, ETC.

With every possible help for Scholarship Students, 1901.

By C. J. PHILLIPS, M.A.,

Latin Master, Stockwell Pupil Teachers' Centre.

THOMAS NELSON AND SONS, 35 and 36 Paternoster Row, London, E.C.; Parkside, Edinburgh; and New York.

The diagrams are printed in colours, fixed on rollers and varnished, and are useful both as wall decorations and illustrations for lessons in Object Teaching.

MACMILLAN AND CO., LIMITED.

Algebra for Elementary Schools. Part I. By Hall and Wood. The authors' names are sufficient guarantee of the careful preparation of this little manual. It is the very thing for those schools where algebra is taken.

Register of Admission.

Summary of Attendance for Boys' or Girls' Departments.

Summary of Attendance for Mixed or Infants' Departments.

These registers have been compiled in accordance with the latest requirements of the Code. They are well-bound and printed. We can thoroughly commend them to the notice of all clerks and teachers.

THOMAS NELSON AND SONS.

Nelson's Supplementary Readers. No. X.: David Copperfield's Boyhood. This is deservedly a very popular series of readers. These entirely meet the requirements of the Code for a continuous reading book. This particular one, No. X., will, we fancy, be in great demand, for the story of David Copperfield should be familiar to all. The get-up is neat and substantial, and the type is of the usual excellence of these publishers.

DAVID NUTT.

English Composition. By L. Cope Cornford. We have nothing but praise for this book. The idea of the author is to supersede the long and laborious study of the dead languages of Greece and Rome, as a means of teaching English composition, by a careful and deep study of the English language itself. In France and Germany this method is already being practised. This manual on theory and practice, though primarily intended for teachers, will also be found useful to the pupils themselves. Some of the best specimens of literature are laid under tribute, and treated by the author in a very effective and masterly manner. We expect the book to become very popular.

OLIVER AND BOYD.

Rudiments of English Grammar. By Thomas Dick, F.R.P.S. This is the second edition of a little book which has gained considerable popularity. It is just the kind of book to supply to candidates for County Council and other local scholarship examinations. The author has produced a concise, simple, and practical manual.

GEORGE PHILIP AND SON.

Typical Object-Lesson Pictures, Series No. I. Although considerable care seems to have been taken in drawing up this series, yet the colouring and the drawings themselves leave much to be desired from an artistic point of view. It is of the highest importance that faithful representations, as near to life as possible, shall be placed before the scholar. There is a useful handbook accompanying the set. The pictures are on substantial paper, strengthened and eyeletted at the corners, and there is a strong cardboard box to keep them in.

SWAN SONNENSCHEIN AND CO.

Problems in Education. By William H. Winch, B.A. (Cantab.), Double First-Class Honours, First Queen's Scholar 1883, Newcome Prizeman, Hughes Prizeman, etc., Inspector of Schools for the London School Board. "It was my intention," says the author in his preface, "primarily, to attempt in these essays a series of critical estimates of leading educators, such as Pestalozzi, Froebel, Herbart, Spencer; but with a hope of more positive usefulness, I have rather discussed the burning questions of to-day, approaching them from the philosophic and psychological side." It is not quite clear how the author could have discussed the educators named "in *these* essays," nor does it become clear that the questions discussed are properly described as "burning." Clearness, indeed, is not a prominent characteristic of the work, and for this the writer must thank, or blame, his literary style, if one may call it so, no less than his method of exposition. Some of the blemishes may be due to hurry, such as the use of "educationalist" and "educationist" with apparently the same meaning; others are hardly susceptible of explanation on this ground. "I am not now concerned," we read, "with all the implications and suggestions which *a careful reading* of these few pregnant sentences may *involve*" (the italics here and in the other quotations are ours), and we are reminded of the historic notice, "Customers sending orders from the country will be promptly executed." Again we find, "The first view..... *implies* too great a fixity *to* the so-called elements;" while such sentences as the following are too common, "Nor have we a concept till the universal elements are explicit, without however suppression or disregard of the particular, being rather held in antithesis to the particular." Nay, we even stumble across such solecisms as "Hamilton's magnificent description of words as the fortresses of thought *are* amply justified," and "the actual presentment of many adjectives at work *have* given rise to those notions." In the matter of quotations, which are freely used, we find the two lines:—

> "Where there ain't no ten commandments
> On the road to Mandalay,"

given as if they formed a single quotation from Kipling's well-known poem. Such combinations as "fruitful channels," and an "upshot" which is "broadly expressed," are among the minor annoyances which the reader encounters. When he becomes inured to these, he still has to reckon with such as this, "We cannot forget, however, that the Baconian procedure was to level all intelligences in so far as the advance of science was concerned. *This* we may well deny;" and however much the reader may wish to agree with the writer, he would prefer to know *what* precisely it is that is to be denied.

The "burning questions" might be fairly described as academic discussions on educational theory, directed towards the solution of difficulties few of which are practical, and many surely imaginary, yet all of a decided theoretical interest. The disappointing feature of the book, as has been indicated, is to find that a book with such a title, and by an author with the qualifications enumerated and suggested on the title-page, should fall so very far short in that lucidity of thought and of expression which is essential to a satisfactory treatment of the matters under consideration.

To the ninety pages of text are added some sixty pages of appendix, consisting almost wholly of memoranda written by the author on points of detail arising in the course of his official work. These memoranda increase the bulk of the volume satisfactorily, without adding to its value for the general reader in any appreciable degree. Since most of them were written "as a basis of discussion by the London Inspectors," they may, however, fulfil the writer's hope "that they may prove at least suggestive to the teachers," especially the metropolitan teachers, "who may chance to read them."

UNIVERSITY CORRESPONDENCE COLLEGE PRESS.

First Stage Mechanics: Solids. By F. Rosenberg, M.A., B.Sc. All the subjects in the syllabus of the Elementary Stage of Theoretical Mechanics of Solids of the Board of Education, South Kensington, are included in this book, and as this is the third edition, it affords ample proof that it meets in a very able manner the requirements of students in the subject.

In this, as in other books of this series, dark type is used to denote important parts of the subject. In addition, those portions which may be omitted on a first reading are denoted by an asterisk. This is sure to be of great assistance to those who are reading the subject without the aid of a teacher.

One of the most important features consists in the many illustrative examples worked out in the various sections referred to; these are followed by a large number of carefully arranged exercises, which will thus afford the student necessary practice in numerical work. In addition to the exercises, the examination papers for the last four or five years are given. Answers to these and to the exercises are given at the end of the book.

WADDINGTON AND JACKMAN, LIMITED.

Twenty Graduated Trios. This selection, which may be had in either notation, has been compiled to provide an easy and graduated course from two-part to three-part singing. Teachers will find it very useful.

WHITTAKER AND CO.

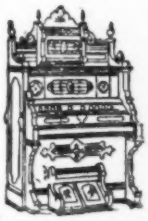
Programme of Technological Examinations. Session 1900-1901, City and Guilds of London Institute. This syllabus contains all that teachers of classes, and students who are entering for the various examinations for which the City and Guilds of London Institute grant certificates, want to know about the subjects they desire to study. It is exhaustive in character, and so useful that it cannot be done without. Its price is one shilling net, or by post one shilling and fourpence.

BRITISH MUSEUM 1 NO 1900

THE

EDUCATIONAL MUSICAL INSTRUMENT CO.

ESTABLISHED 1881.



For Circular, Testimonials, and ANY Maker's List and designs, apply to the

MANAGER, 43 Estate Buildings, Huddersfield,

21 Argyle Crescent, Portobello, EDINBURGH; or at 20 Highbury Place, LONDON, N. *(Close to Highbury Station and Trams.)*

PIANOS, &c., FOR SCHOOL AND HOME USE.

We are offering a range of instruments **specially made** for School work, at prices within the reach of all. We have supplied some **eleven hundred** for this purpose, and can please you fully, and **save you much money.**

In Pianos and American Organs for Home use our lists indicate the best bargains in the market at the prices quoted, cash or instalments, and **many thousands of Teachers, School Managers, etc.,** have testified to the unequalled advantages we offer.

* See our 15 Guinea Piano for £21 Cash, or 36 payments of 14/2 per month.

We pay carriage, give a month's free trial, a ten years' warranty, and **exchange free of cost** if the instrument sent is not all that is desired.

N.B.—All our Pianos are fitted with a special action to the Soft Pedal that **fully subdues the tone,** and **effectually preserves** the instruments during practice.

Mr. JOHN HOPPER, Clerk to the School Board, Hanley, Staffordshire, writes:—"I am instructed to order from you five more Pianos on the terms mentioned in your letter." (We have supplied fourteen Pianos to the Schools under this Board.)

Mr. J. H. YOXALL, M.P., Gen. Sec., N.U.T., writes:—"I enclose cheque in payment for Piano; the choice reflects the greatest credit on your firm. I am entirely satisfied with it in all respects, and I feel sure that a customer benefits very much by taking advantage of your experience and large connection."

Show Rooms open Daily. Call and see our Stock, or write for our List of Instruments for Home or School Use, specifying the class preferred, and you will find

WE CAN SAVE YOU MANY POUNDS.

(Please mention this Paper.)

THE MOST NUTRITIOUS.

EPPS'S

GRATEFUL—COMFORTING.

COCOA

BREAKFAST—SUPPER.

BORD'S PIANOS.

FOR SALE, with 25 per cent. Discount for Cash, or 14s. 6d. per month (second-hand, 10s. 6d. per month) on the Three Years' Hire System. Lists free of CHAS. STILES & Co., 40 and 42 Southampton Row, Holborn, London, W.C.—Pianos exchanged.

BECHSTEIN PIANOS.

These magnificent Pianos for hire on the Three Years' System, at advantageous prices and terms. Lists and particulars free of CHAS. STILES & Co., 40 and 42 Southampton Row, Holborn, London, W.C.

. . CRAMER'S . .
Educational Pianos.

THE PORTABLE, Compass 5 Octaves, - 15 Guineas.
In American Walnut and Mahogany.

THE SCHOOL-ROOM PIANO, 7 Octaves, 24 Guineas.
In Ebonised Case.

THE COLLEGE MODEL IRON COTTAGE, 7 Oct., 38 Gns.
In Rosewood, Walnut, and Ebonised.

On Cramer's Three Years' System, or Liberal Discounts for Cash.

J. B. CRAMER & CO., Ltd.,
207 and 209 Regent Street, W., and 46 Moorgate Street, E.C.
Telephone 5012—"Gerrard." *Telegrams—"Fortissimo," London.*

INK.

"Duckett's Dry Inks" (Cold-water Ink-powders) produce Ink at less than a quarter of the cost of equal quality Fluid Ink, and with less trouble. Though thousands of schools have adopted them, other thousands have not yet given them a trial. That is a great pity, seeing we offer samples gratis and post free to teachers, representative men, etc., all the world over. Address always:—

DUCKETT'S DRY INKS, SHEFFIELD.

ARMSTRONG'S DRAWING SCHOOL.
23 The Avenue, Bedford Park, London, W.

CORRESPONDENCE DEPARTMENT.
Courses for all Drawing Examinations.

Thorough guidance, and criticism of all drawings, by **Mr. C. ARMSTRONG,** **Late Head Art Master, City of London School of Art,** and Cusack Institute; **Trained Teacher,** Education Department's Certificate; **Trained Art Master,** Royal College of Art, Art Department's Certificate; an **Examiner** to the Art Department; **Author** of the well known text-books—Cusack's "Shading," "Model," and "Freehand Ornament;"

And with ten years' experience in teaching drawing by Correspondence.

Special Courses for Scholarship Students.

L.L.A.

THE UNIVERSITY PREPARATORY INSTITUTE, 37 Chambers St., Edinburgh, with strong Staff of Graduates, L.L.A.'s, and Specialists, prepares Ladies thoroughly for this Degree in Two Sessions, at their own homes, subjects being selected by themselves. System includes plans of study, weekly tests, careful correction, evaluation, and criticism. Class, Open, and L.L.A. Prizes. **118 L.L.A. successes in 1900.** Moderate Fees. Students may now be enrolled for 1st term of Session 1900-1. The L.L.A. Guide for 1901, 1s.; the L.L.A. Prospectus, free. Address—The SECRETARY, as above.

NEW EDITION. 57th YEAR OF PUBLICATION.

Reduced Fac-Simile of Cover.

Wightman's Arithmetical Table Book.

Embraces the principal Tables that should necessarily be acquired by the student in all grades. A remarkably compact and useful book.

Crown 16mo, 64 pages.

PRICE ONE PENNY.

Many Million copies of this valuable work have been sold.

MAY BE HAD OF
SIMPKIN, MARSHALL, HAMILTON, KENT & CO., LTD.,
Stationers' Hall Court and Paternoster Row;
OF THE PRINCIPAL SCHOLASTIC AGENCIES,
AND OF THE PUBLISHERS,
WIGHTMAN & CO., Ltd., Old Westminster Press, Regency St., S.W.; and 43 Essex Street, W.C., London.

The Royal School Series.

An entirely New Series of Literary Reading Books, specially adapted to Girls' and Mixed Schools.

The Royal Princess Readers.

The lessons are carefully selected, graduated, and edited.
The illustrations are the work of well-known artists. Many coloured pictures, beautifully reproduced by the Three Colour Process, adorn each book.
The type is beautifully clear.
The paper and binding are of the highest quality.

No pains have been spared to make The Royal Princess Readers the most attractive yet published.

THE FOLLOWING ARE NEARLY READY:—

Book I. Price 8d. | **Book III. Price 1s.**
Book II. Price 10d. | **Book IV. Price 1s. 3d.**

Books V. and VI. are in active preparation.

*** Sound literary workmanship, careful editing, beautiful illustrations, good paper, printing, and binding are special features of this set of Readers, which ought to find great favour in every school; for though *The Princess Readers* are primarily intended for girls, they contain much that will benefit and delight boys.

Before changing your Readers see "The Royal Princess Readers."

NELSON'S SUPPLEMENTARY INFANT READERS.

With Coloured Illustrations.

Just Published.

No. 2. "OVER THE HILLS AND FAR AWAY."

A Continuous Story Reader for the "Sixes." With Four Coloured and many other Illustrations. Printed in large clear type, strongly bound, cloth, price 6d.

A charming little story, simply and naturally told, introducing children's holiday experiences at a Farm and by the Seaside.

Already published in this Series.

No. 1. "UP TO LONDON TO SEE THE QUEEN." Price 6d.

Just Published.

A Short History of Ancient Greece

for the Young. By HENRY JOHNSTONE of the Edinburgh Academy. With numerous Illustrations. 173 pages, cloth, price 1s. 6d.

*** Very suitable for an Upper Class Reader, or for a Supplementary Reader for the Higher Standards. It is attractive both as to matter and appearance, and is intended to provide a History that young people may like to read and grown people be glad to have read.

NELSON'S SUPPLEMENTARY READERS.

Specially Edited. Specially Annotated. Specially Cheap.

Providing a Wide Range and Variety of Good Reading. With Illustrations.

12 Books ready. Price 3d. each; or, in limp cloth, 4d. each.

*** *Complete List on application.*

VOLUME I., containing "Richard of the Lion Heart," "The Settlers at Home," "Little Nell," bound together, cloth boards, price 1s. 3d.

JUST PUBLISHED.

DOMESTIC SCIENCE.

The Science of Domestic Economy and Hygiene Treated Experimentally.

By THOMAS CARTWRIGHT, B.A., B.Sc., Author of "Elementary Practical Chemistry," "'Section One' Physiography," etc.

With numerous Illustrations. 215 pages. Cloth, 2s.

*** This volume fully covers the subject of Domestic Science as set out in Specific Subject XIV. of the Education Department's Code.

ELEMENTARY PRACTICAL CHEMISTRY

For Schools of Science.

By THOMAS CARTWRIGHT, B.A., B.Sc., Author of "'Section One' Physiography."

With numerous Illustrations. Cloth, price 2s.

Evening Continuation Schools.

SESSION 1900-1901.

T. NELSON & SONS'

EVENING CONTINUATION SCHOOL CATALOGUE

Contains a list of Suitable Text-Books arranged in Groups, according to the Department's Syllabus of Concise Schemes.

****** Responsible Teachers should make a point of seeing this Catalogue. A Copy will be sent post free on application.***

THE BEST BOOKS FOR THE ALTERNATIVE COURSE

In Geography.

THE ROYAL OSBORNE GEOGRAPHY READERS.

Well Planned. Brightly Written. Carefully Graduated.

With Spelling Lists, Summaries, Notes and Meanings, and Beautiful Illustrations.

Book IV. (for Standard IV.) **Sea and Lan** Price 1s. 3d.

Book V. (for Standard V.) **Great Britain a Ireland.** Price 1s. 6d.

Book VI. (for Standards VI. and VII.) **T British Empire: Its Geography a Commerce.** Coloured Maps. 384 pag Cloth, price 1s. 8d.

In History.

THE ROYAL WINDSOR HISTORY READERS.

Attractively Written. Beautifully Illustrated.

Book IV. (for Standard IV.) **Stories and Bi raphies from British History, 55 B to 1603 A.D.** Price 1s. 3d.

"We know of no better readers."—*Teachers' Aid.*

Book V. (for Standard V.) **Stories and Bi raphies from 1603 to the Present Ti** Price 1s. 6d.

"Cannot fail to be a favourite."—*Schoolmistress.*

Book VI. (for Standards VI. and VII.) **Reign of Queen Victoria**—Growth of Empire. Price 1s. 8d.

"We cannot speak too highly of the book."—*School*

*** *Specimen free to Head-Teachers.*

T. NELSON & SONS, 35 & 36 Paternoster Row, London, E.C.; Parkside, Edinburgh; and New Yo

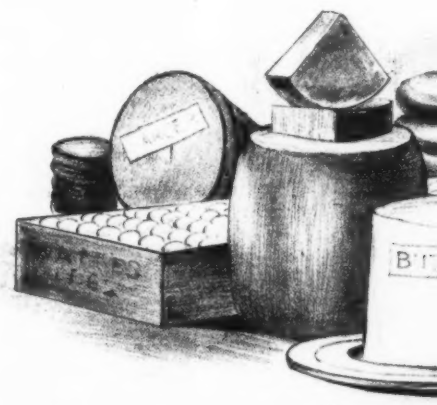
FOOD AND DRINK, £208,000,000

£63,000,000

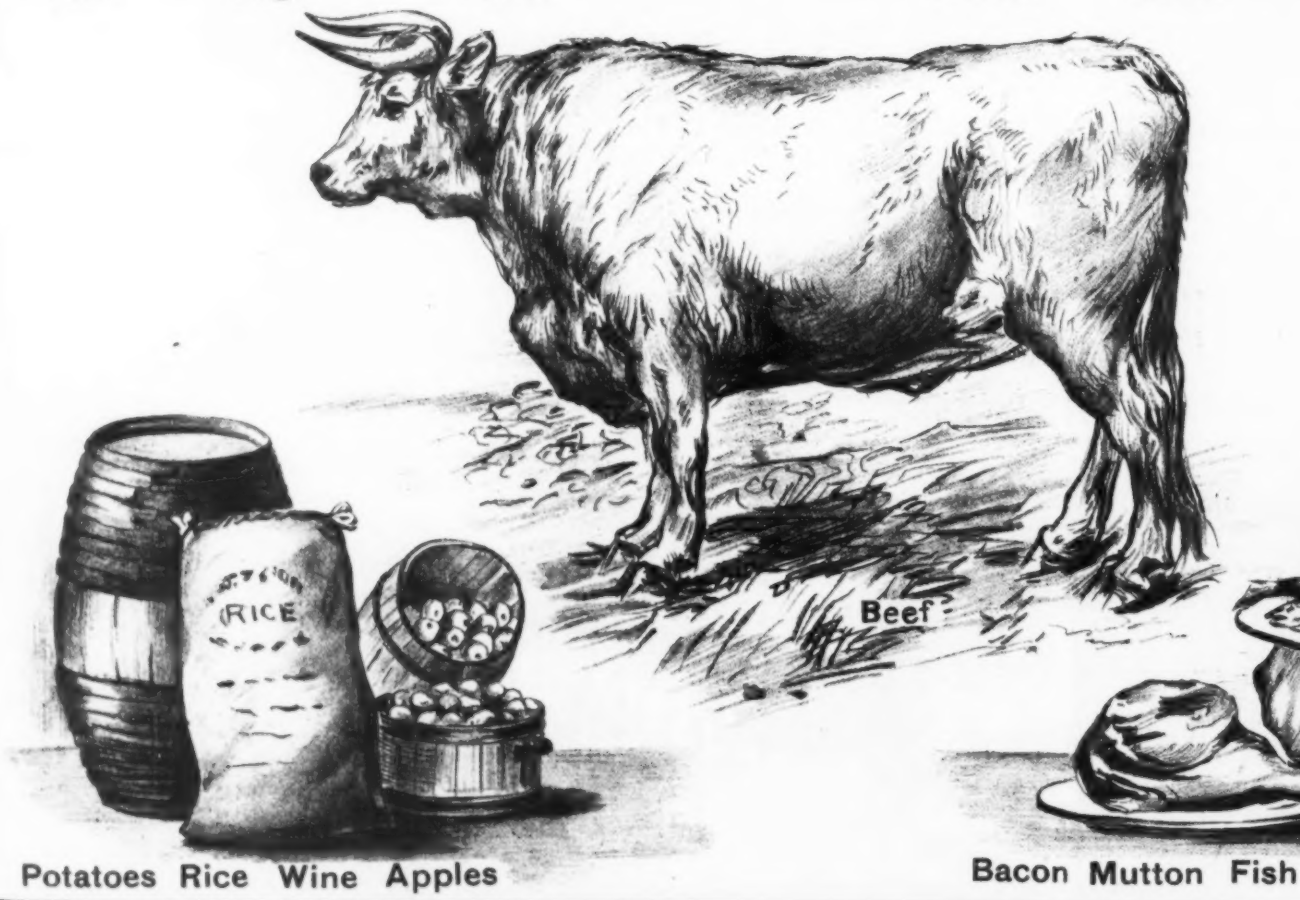
Wheat

£145,000,000

Tea Sugar Coffee



Cheese Butter



Potatoes Rice Wine Apples

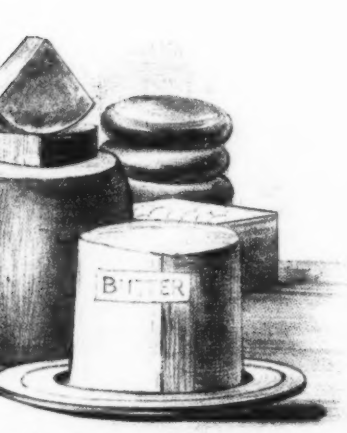
Bacon Mutton Fish

GRAPHIC STATISTICS

BRITISH IM
BRITISH EX

000

eat

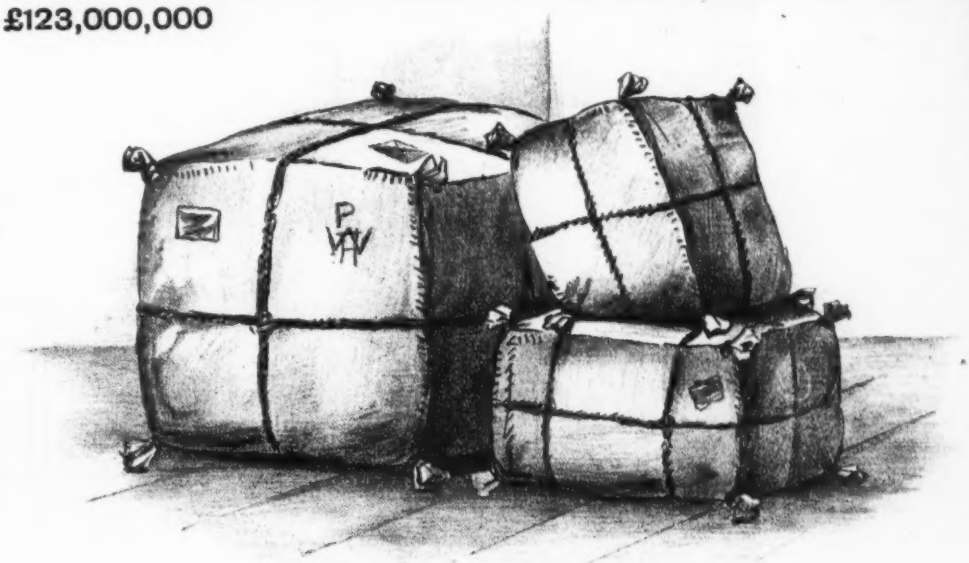


tter Eggs

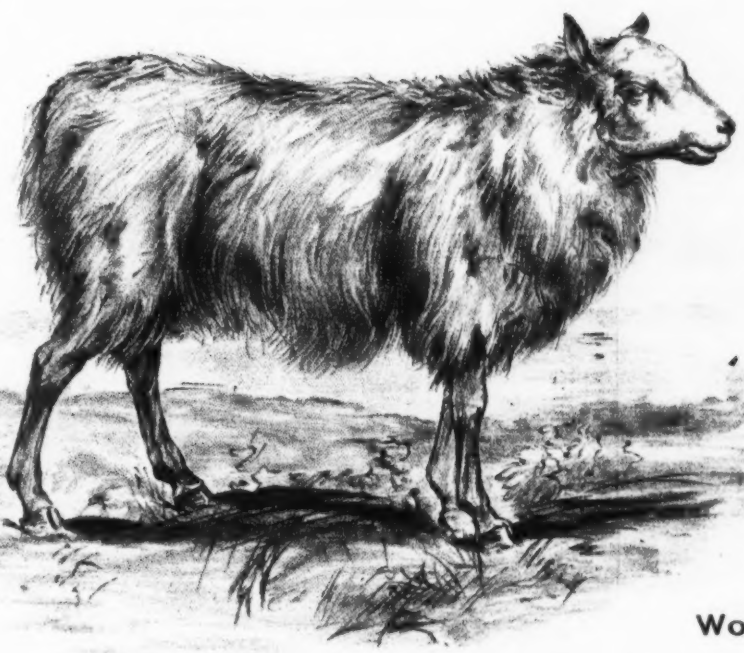
on Fish Corned Beef

MATERIALS for MANUFACT

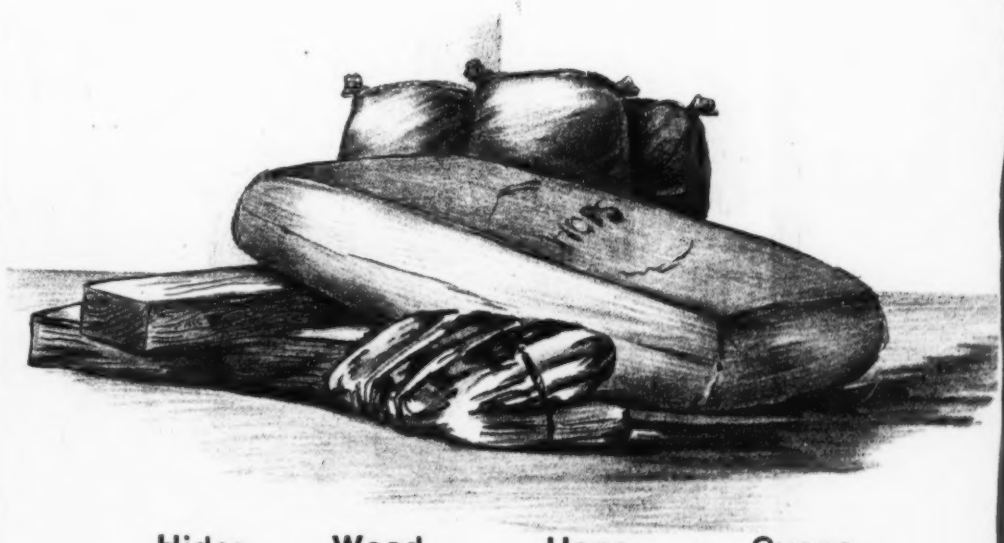
£123,000,000



Cotton Flax Silk



Wool



Hides Wood Hops Guano

ICS OF BRITISH COMMERCE.

I IMPORTS, £470,000,000.

I EXPORTS, £233,000,000..

ACTURE, £262,000,000

£52,000,000

Copper Lead Iron Zinc

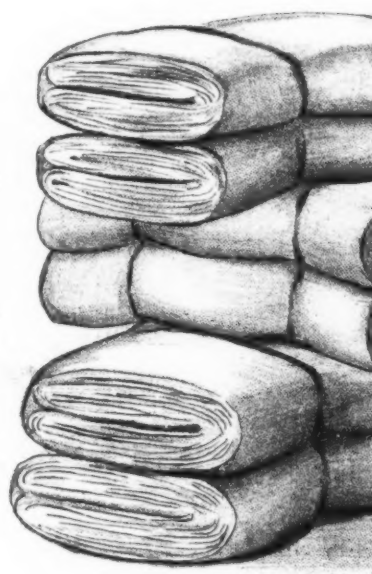
Chemicals Oils

£81,000,000

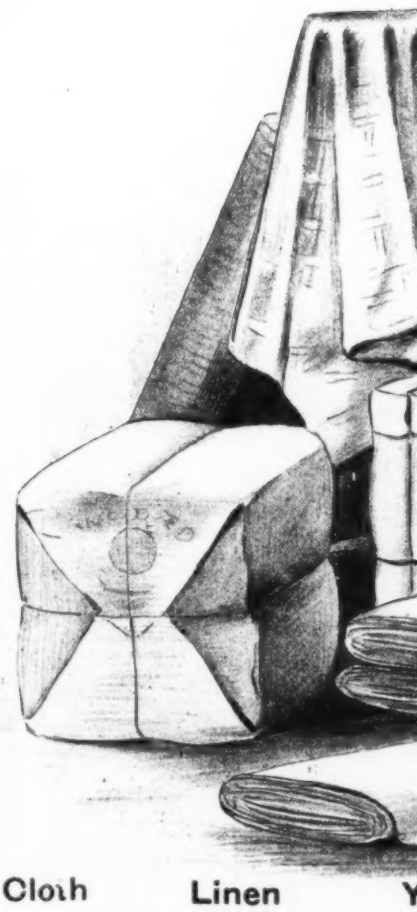
Miscellaneous

TO

£94,000,000



Calico

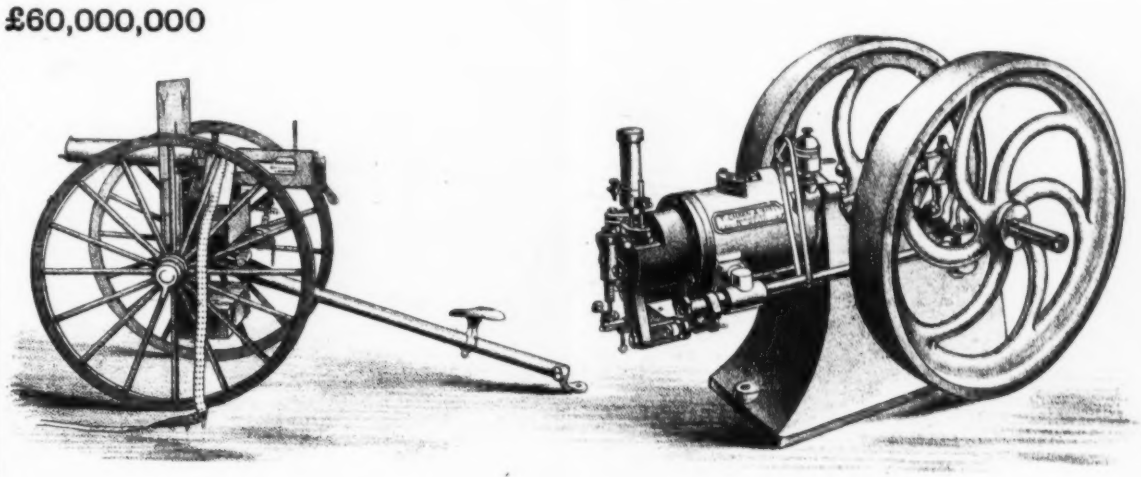


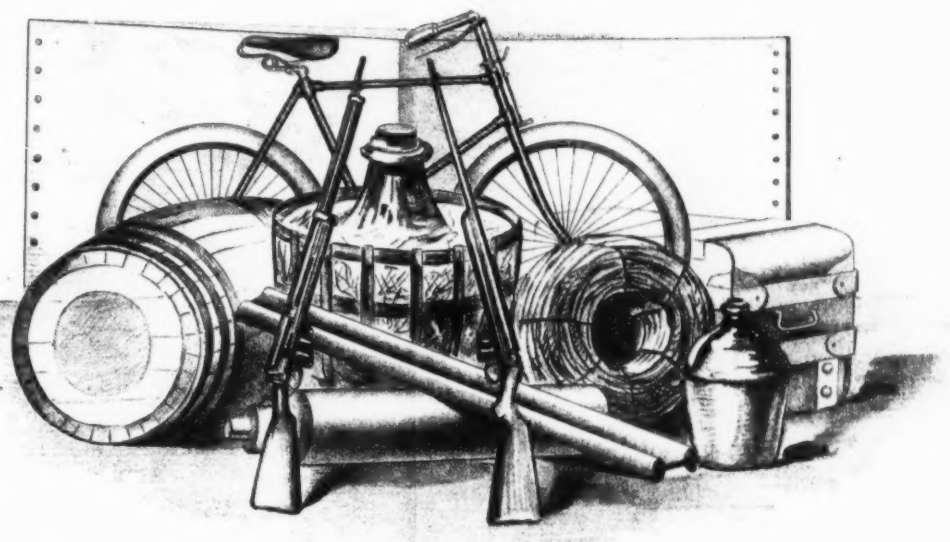
Cloth Linen Y

TOTAL EXPORTS, £233,000,000

Yarn

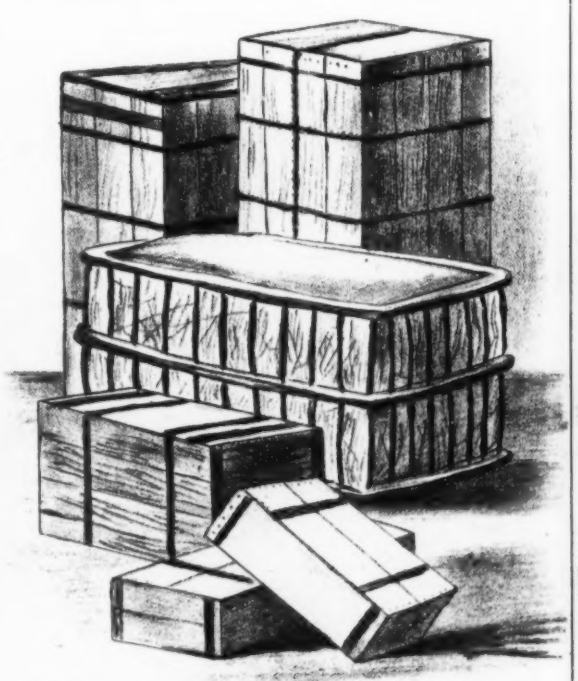
£60,000,000





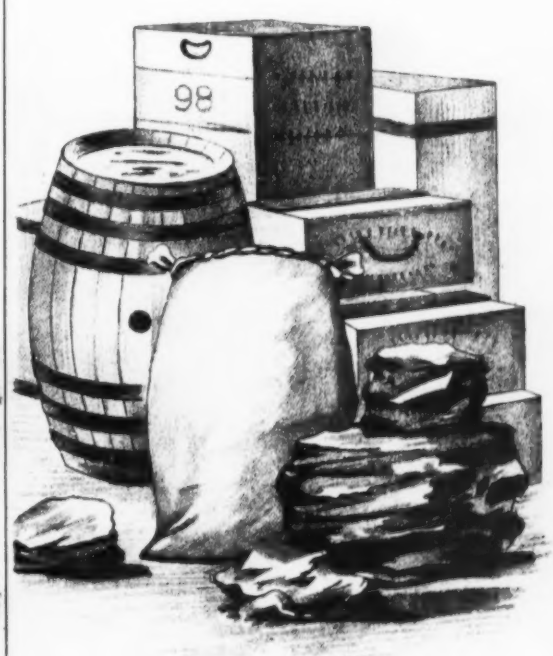
Machinery Chemicals

£45,000,000



Miscellaneous

£34,000,000



Food Drink Raw Materials

The best graded, most educational, and completely practical course yet produced.

NELSON'S
NEW DRAWING COURSE

- - OF - -

DRAWING, DESIGN, AND MANUAL OCCUPATIONS.

By J. VAUGHAN, Art Master, London School Board.

THIS Scheme of Drawing and Manual Training is now in course of issue. It consists of a set of large Wall Sheets or Cards for each stage or standard, printed in Grey Pencil Line and in Colour, and a profusely-illustrated Handbook for Teachers.

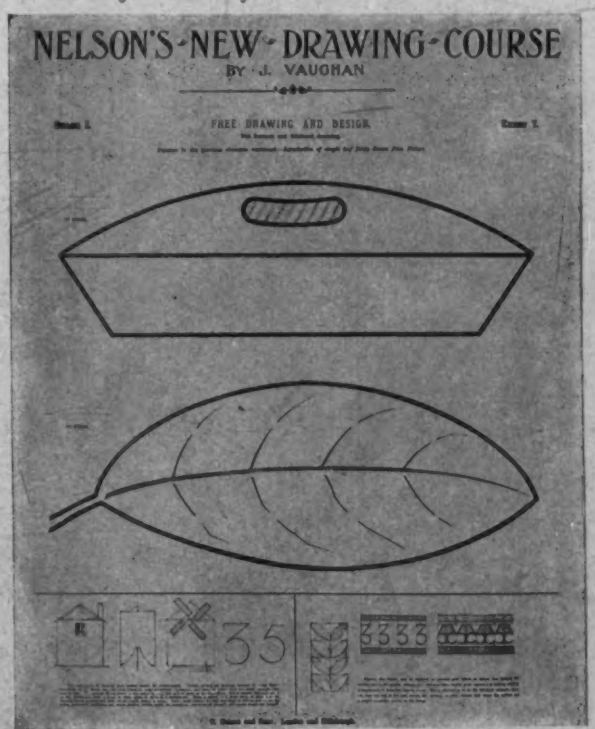
The following divisions of the subject are fully worked out:—

1. **Freehand and Free-arm Drawing,** the figures being printed in grey pencil line.

2. **Design,** based on the freehand studies.

3. **Drawing from Nature,** suitable exercises for each stage being taken from concrete objects.

4. **Mechanical Drawing** or Ruler work, both apart from and combined with freehand.



Specimen Sheet, reduced, NELSON'S NEW DRAWING COURSE.

5. **Colour Work,** in chalks, wash, and coloured paper, combined with mechanical drawing and design.

6. **Brush Drawing,** applied to design and to natural forms.

7. **Clay Modelling,** arranged so as to proceed *pari passu* with the main drawing scheme.

This forms by far the most complete, varied, and artistic Drawing Course which has yet been prepared for schools, and the number of manual training subjects provides a wide enough option to suit schools of the most diverse character as regards size, staff, and locality. The grading is perfect, being the outcome of many years' experience in practical work by the author, Mr. J. VAUGHAN, Art Master, London School Board.

Each Set consists of 10 Sheets (which will, in the average school, correspond to a year's work, one sheet for each month of the school year), mounted on one roller and printed on both sides, size 20 by 27 inches. Price 12s. 6d. per set. In strong cloth portfolio, price 15s. per set. They may also be obtained printed on stout cardboard, suitable for wall decoration, and available for simultaneous use in separate classes.

T. NELSON & SONS, 35 & 36 Paternoster Row, London, E.C.; Parkside, Edinburgh; and New York.

BLACKIE & SON'S NEW ILLUSTRATED BOOKS

FOR SCHOOL PRIZES, REWARDS, ETC.

By G. A. HENTY.

With Buller in Natal; or, A Born Leader. With 10 Page Illustrations by W. Rainey, R.I., and a Map. 6s.

In the Irish Brigade: A Tale of War in Flanders and Spain. With 12 Illustrations by Charles M. Sheldon, and 2 Maps. 6s.

Out with Garibaldi: A Story of the Liberation of Italy. With 8 Page Illustrations by W. Rainey, R.I., and 2 Maps. 5s.

For Name and Fame; or, To Cabul with Roberts. With 8 Page Illustrations by Gordon Browne. *New Edition.* 5s.

Mr. HENTY'S PREVIOUS BOOKS.

Price 6s. each.

Won by the Sword.
A Roving Commission.
Under Wellington's Command.
Both Sides the Border.
With Frederick the Great.
With Moore at Corunna.
At Agincourt.
With Cochrane the Dauntless.
A Knight of the White Cross.
The Tiger of Mysore.
Wulf the Saxon.
St. Bartholomew's Eve.
Through the Sikh War.
Beric the Briton.
In Greek Waters.
The Dash for Khartoum.
Redskin and Cowboy.
By Right of Conquest.
By England's Aid.
With Lee in Virginia.

Price 6s. each.

By Pike and Dyke.
The Lion of St. Mark.
Captain Bayley's Heir.
Bonnie Prince Charlie.
For the Temple.
The Young Carthaginian.
With Wolfe in Canada.
When London Burned.
The Lion of the North.
With Clive in India.
In Freedom's Cause.
Through the Fray.
Under Drake's Flag.
True to the Old Flag.

Price 5s. each.

Through Russian Snows.
In the Heart of the Rockies.
A Jacobite Exile.
Condemned as a Nihilist.
Held Fast for England.
Maori and Settler.
One of the 28th.
In the Reign of Terror.
Orange and Green.
Bravest of the Brave.
A Final Reckoning.
The Cat of Bubastes.
Dragon and the Raven.
St. George for England.
By Sheer Pluck.
Facing Death.

Price 5s. each.

No Surrender.
At Aboukir and Acre.
A March on London.
On the Irrawaddy.

Price 3s. 6d. each.

The Young Colonists.
A Chapter of Adventures.

By Katharine Tynan.

Three Fair Maids; or, The Burkes of Derrymore. With 12 Page Illustrations by G. Demain Hammond, R.I. 6s.

By Rosa Mulholland (Lady Gilbert).

Cynthia's Bonnet Shop. With 8 Page Illustrations by G. Demain Hammond, R.I. 5s.

By Captain F. S. Brereton.

With Rifle and Bayonet: A Story of the Boer War. With 8 Illustrations by Wal Paget. 5s.

By Captain F. S. Brereton.

In the King's Service: A Tale of Cromwell's Invasion of Ireland. With 8 Page Illustrations by Stanley L. Wood. 5s.

By Alice Stronach.

A Newnham Friendship. With 6 Page Illustrations by Harold Copping. 3s. 6d.

By Gordon Stables.

In Far Bolivia: A Story of a Strange Wild Land. With 6 Illustrations by J. Finnemore, R.I. 3s. 6d.

By Léon Golschmann.

Boy Crusoes: A Story of the Siberian Forest. Adapted from the Russian. With 6 Page Illustrations by J. Finnemore, R.I. 3s. 6d.

By Meredith Fletcher.

Every Inch a Briton: A School Story. With 6 Illustrations by Sydney Cowell. 3s. 6d.

NEW BOOKS OF THE HALF-CROWN SERIES.

By Walter P. Wright.

An Ocean Adventurer; or, The Cruise of the *Orb*. With 4 Illustrations by Paul Hardy.

By Jane H. Spettigue.

A Trek and a Laager: A Borderland Story. With 4 Illustrations by Paul Hardy.

By Edith King Hall.

Adventures in Toyland. Profusely Illustrated. *New Edition.*

By Bessie Marchant.

Held at Ransom: A Story of Colonial Life. With 4 Illustrations by Sydney Cowell.

By W. O'Byrne.

Kings and Vikings: Stories of Irish History. With 6 Page Illustrations.

By Michael Macmillan.

Tales of Indian Chivalry. With 6 Page Illustrations.

New Book by Judge Parry, Illustrated by Walter Crane.

The Story of Don Quixote. Retold by His Honour Judge Parry. Illustrated by Walter Crane. With 11 Coloured Full-Page Plates, 19 Half-Page Plates, a Title-Page, and Cover. Royal 8vo. Cloth. 6s.

New Picture Book of Humour by Harry B. Neilson.

Droll Doings. Illustrated by Harry B. Neilson, with Verses by the Cockiolly Bird. 23 Full-Pages and 18 Vignettes in Full Colour. Royal 4to, picture boards, cloth back. 6s.

NEW CHILDREN'S PICTURE BOOKS.

My Very Best Book. With Coloured Illustrations. 4to. 1s.

Our Darling's First Book. Bright Pictures and Easy Lessons for Little Folk. 4to. 10½ inches by 7½ inches, picture boards, 1s.; cloth, gilt edges, 2s.

Arm-Chair Stories. With Coloured Illustrations. 4to. 1s.

Story-Book Time. With 38 Colour Pages, over 40 Full-Page Black and White Illustrations, and a large number of Vignettes. Picture boards, 2s. 6d.; cloth, gilt edges, 3s. 6d.

New Volumes of the Three Shilling Series.

The Golden Magnet. By G. Manville Fenn. *New Edition.*

'Twixt School and College. By Gordon Stables. *New Edition.*

Giannetta. By Rosa Mulholland. *New Edition.*

New Volumes of the Two Shilling Series.

Jones the Mysterious. By Charles Edwardes.

The Adventures of Roly. By H. Elrington.

Queen Charlotte's Maidens. By Sarah Tytler.

Arthur's Inheritance. By Emma Leslie.

Gutta-Percha Willie. By George MacDonald. *New Edition.*

New Volumes of the Eighteenpenny Series.

Tony Maxwell's Pluck. By Geraldine Mockler.

A Cruise in Cloudland. By Henry Frith. *New Edition.*

Dulcie King. By M. Corbet-Seymour. *New Edition.*

New Volumes of the Shilling Series.

Do Your Duty. By G. A. Henty. *New Edition.*

Betty the Bold. By E. Davenport Adams.

Jack of Both Sides. By Florence Coombe.

Tony's Pains and Gains. By W. L. Rooper.

Terry. By Rosa Mulholland (Lady Gilbert).

New Volumes of the Ninepenny Series.

Three Troublesome Monkeys. By A. B. Romney.

That Boy Jim. By Mrs. Henry Clarke.

The Adventures of Carlo. By Katharine Tynan.

The Shoeblack's Cat. By W. L. Rooper.

The Little Red Purse. By Jennie Chappell.

New Volumes of the Sixpenny Series.

Bravest of All. By Mabel Mackness.

Winnie's White Frock. By Jennie Chappell.

Lost Toby. By M. S. Haycraft.

A Boy Cousin. By Geraldine Mockler.

Travels of Fuzz and Buzz. By Geraldine Mockler.

Teddy's Adventures. By Mrs. Henry Clarke.

Blackie and Son's New Illustrated Catalogue of Books suitable for Presentation, School Prizes, Rewards, etc., sent post free on application.

LONDON: BLACKIE & SON, LIMITED, 50 OLD BAILEY.

BRITISH MUSEUM 16 NOV 1900

COUPON
PRACTICAL TEACHER
November 1900.

Printed and Published by Thomas Nelson & Sons, Proprietors, at the Office of "The Practical Teacher," 35 & 36 Paternoster Row, London, E.C.